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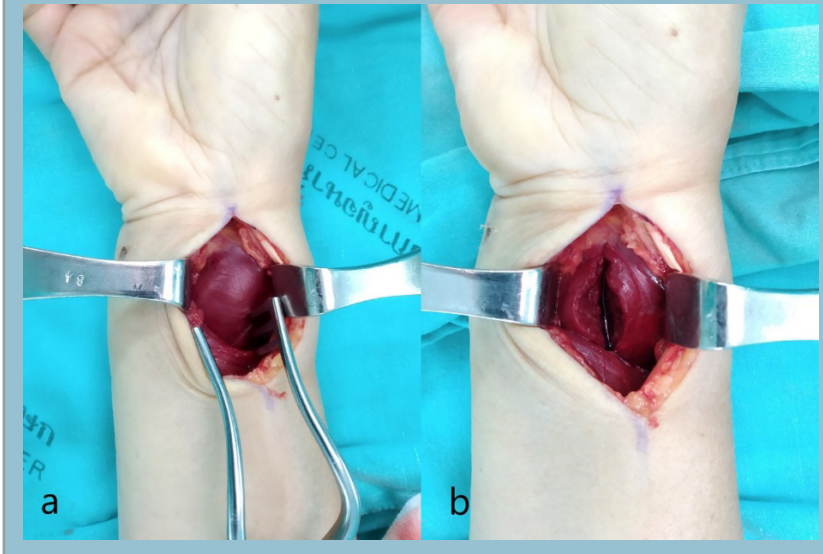

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Eating Disorders and their Relation with Emotional Disturbances among Undergraduate Students in Malaysia during COVID-19 Pandemic

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ABSTRACT

Objective: COVID-19 pandemic has greatly impacted several aspects of undergraduate students' lives including significant effect on mental wellbeing, physical activity and eating habits which might increase the risk for developing eating disorders as these disorders tend to emerge at university age. This study aimed to assess the prevalence of eating disorders and their associated factors among undergraduate students.

Materials and Methods: A cross sectional study was conducted among 624 undergraduate students from three different universities in Malaysia. Eating disorders was assessed using the Malay version of the Eating Disorder Examination Questionnaire (EDE-Q) while the emotional disturbances was assessed by the Malay version of Kessler Psychological Distress Scale (K10) and perceived social support was assessed by the revised Malay version of The 8-item Multidimensional Scale of Perceived Social Support (MSPSS).

Results: The prevalence of eating disorders among students was 14.9%. There were significant differences in terms of gender and other socio-demographic factors. Eating disorders were significantly associated and positively correlated with emotional disturbances level r = 0.37. While inverse correlation between social support and eating disorders was also shown r= -0.13. Multiple linear regression analysis showed that emotional disturbances level (β = 0.212, P = 0.000) and poor social support (β = -0.126, P = 0.002) were a significantly important risk factor.

Conclusion: Eating disorders are prevalent among undergraduate students, female students, emotional disturbances and high BMI are significantly associated factors. Emotional disturbances and poor social support are predictive factor for eating disorders.

Keywords: Eating disorders; psychological distress; social support; undergraduate students; Malaysia (Siriraj Med J 2023; 75: 481-487)

INTRODUCTION

Eating disorder is a behavioral condition characterized by persistent disturbance in eating behaviors and habits which is associated with distressing emotions and thoughts affecting physical, psychological, and social function.[1] A substantial number of young population a vulnerable to develop eating disorders as 5.5-17.9% of young women and 0.6-2.4% of young men have experienced a DSM-5 eating disorder by early adulthood.[2]

Obsessions with food, appearances and weight may also indicate eating disorders which is generally categorized as anorexia nervosa, bulimia nervosa and binge-eating problems. Eating disorders can also cause a number of problems including: lack of self-esteem, depression and anxiety.[3]

Emotional disturbances are a form of psychological distress in which there is mixture of depression and anxiety symptoms that may result in functional disabilities and

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behavioural problems.[4,5] It has been linked with higher risk of development of eating disorders whereby people who are under stress or depression are more likely to have disordered eating.[6]

Since the beginning of COVID-19 pandemic there has been several changes in people's lifestyles due to the movement control orders, social isolation and having to stay indoors for long periods of time along with fear of getting infected with the virus and uncertainty of the future. This sudden and drastic change in lifestyle brought a surge in mental health issues ranging from stress, anxiety and depression.[7]

Students at colleges and universities were also significantly affected by the pandemic as they were required to comply with the lockdown and were forced to continue their studies online which was a new way of learning that the students were not familiar to, which on top of their usual academic stressors, increased the psychological burden on them and affected their mental wellbeing leading to many students fearing academic delay and becoming severely stressed.[8]

This situation is likely to increase the risk and symptoms of eating disorders (EDs). In the context of COVID-19 pandemic, three factors were suggested that could make this pandemic more likely to cause EDs; changes in daily routines, media exposure that are EDs-specific or anxiety-provoking and restrictive diet to boost immunity.[9] There may also be evidence of increase in severity of symptoms of EDs during COVID-19 pandemic due to specific factors such as fatphobic messages, restricted access to healthcare and food insecurity.[10] However, in Malaysia, studies on eating disorders are generally scarce and most of the conducted studies are among teenagers. Our study aimed to assess EDs among young adults. Furthermore, our aim is to assess the impact of emotional disturbances during COVID-19 pandemic on eating disorders.

MATERIALS AND METHODS

This is cross-sectional study using convenient sampling method was conducted on a sample of 624 undergraduate students from 3 different public universities in Malaysia. The estimated sample size needed was 500, based on a power of 0.95, and the expected prevalence of eating disorders among university students in Malaysia is 13.9%[11], with ±5% as margin of error. More participants were included to account for any dropouts.

Prior to conducting this study, ethical approval was granted by the International Islamic University Malaysia Research Ethics Committee (IREC ID: 2021-140). Informed consent was obtained from the participants after fully explaining the objectives of the research to them. Participation was entirely voluntary for all participants. All participants were assured of the confidentiality and exclusivity of the data collected for research purposes. To reduce the effects of additional stress, the study was conducted in the middle of the semester, away from the exams period. The inclusion criteria are students aged 18-24 years who agreed to participate in the study and registered as undergraduate students of the participating universities.

Questionnaires

The following questionnaires were used in the study:

Sociodemographic Background characteristics

Participants' sociodemographic status (faculty, year of study, age, gender, ethnicity, marital status, accommodation, household income, household income), past medical history and past psychiatry history. Other lifestyle status: Physical activity, smoking status.

The Eating Disorder Examination Questionnaire (EDE-Q)[12]

It is a 28-item self-reported questionnaire adapted from the semi-structured interview Eating Disorder Examination (EDE) and designed to assess the range and severity of features associated with a diagnosis of eating disorder using 4 subscales (Restraint, Eating Concern, Shape Concern and Weight Concern) and a global score. Each item relates to the previous month and a half, and the frequency or intensity is rated on a seven-point Likert scale (where 0 indicates that the feature was not present at all and 6 indicates that the feature was present every day or to an extreme degree).

The Malay version of EDE-Q was used in this study. It has good psychometric properties[13] It is valid and reliable with global Cronbach's alpha value of 0.879.[14]

The global score is calculated by taking the mean of each of the subscale. The cut-off score for clinical significance of each of the subscales and the global score is ≥4[15,16]

Kessler Psychological Distress Scale (K10)

It is a self-report questionnaire consisting of ten questions with the purpose of determining a person's level of psychological distress. The questionnaire asks questions about anxiety and depressive symptoms that a person has experienced within the past four weeks. Each inquiry pertains to a particular feeling state, and there is a response scale that ranges from one to five points.[17]

In this study, the Malay version of the K10 which

was translated in a previous study by Tiong et al and found to be a valid and reliable screening instrument for psychological distress in a population from Malaysia.[18]

The revised Malay version of the 8-item Multidimensional Scale of Perceived Social Support (MSPSS)

It was used to assess the level of perceived social support by the students. It is a brief research instrument meant to examine perceptions of support from three sources: family, friends, and a significant other. The original MSPSS was developed by Zimet *et al.* which contains 12 items. The reliability, validity and factor structure of the MSPSS have been demonstrated across a number of different samples.[19,20]

The revised 8-item MSPSS-M had good internal consistency, as indicated by Cronbach's alpha coefficients of 0.91, 0.93, and 0.92, respectively, for the total scale, family, and friends variables. For the purpose of determining the participants' levels of social support in this study, we utilised a redesigned version of the 8-item MSPSS-M.[21]

Statistical analysis

Both descriptive and inferential analysis were carried out with the help of SPSS software version 26.0. The findings of the analysis of the factors, which included age group, gender, nationality, monthly household income, marital status, academic year, and type of accommodation, were presented in the form of numbers and percentages.

In order to determine whether or not the distribution of each variable was normal, the Kolmogorov-Smirnov tests were carried out. The Independent T-test and One-way ANOVA were used to determine the univariate association between the demographic variables (gender, study phase, family monthly income, age, accommodation, psychological distress level, and body mass index). Then, each of the variables of eating disorders that had an association that got statistical significance in the univariate analysis of eating disorders ($p< 0.05$) was included in the multiple linear regression models for eating disorders. It was determined to be significant if the value of P was less than 0.05.

RESULTS

It was found that the 624 participants have a mean age of 21.79 years. 457 (73.2%) of the participants were female, 619 (99.2%) were single, and 242 (38.8%) had a low family income. 318 (51.0%) of the students stayed at home with their parents, 143 (22.9%) were severely distressed, and 373 (59.8%) had normal BMI levels. The prevalence of eating disorders was 14.9%. The mean scores for each subscale were analyzed and a cut-off score of ≥4 is considered as clinically significant and it was found that the mean score for shape concern is the highest. (Table 1). There were statistically significant differences ($P < 0.05$) in terms of gender, age, year of study, living situation, psychological distress, and BMI among individuals with an eating disorder. (Table 2)

According to the results of the Spearman correlation test, there is a positive correlation between psychological distress and eating disorders, whereas there is an inverse correlation between eating disorders and the level of social support (Table 3).

Multiple linear regression analysis showed that psychological distress (with a β coefficient of 0.212 and a significance level of 0.000) and social support (with a β coefficient of -0.126 and a significance level of 0.002) are significantly important risk factors for eating disorders among the students (Table 4).

TABLE 1. Prevalence and mean score for EDE-Q subscales.

Subscale	N (%)	Mean (SD)
Restraint Concern		
Clinically significant	583 (93.4)	5.98 (7.13)
Non significant	41 (6.6)	
Eating Concern		
Clinically significant	604 (96.8)	4.43 (5.64)
Non significant	20 (3.2)	
Shape Concern		
Clinically significant	536 (85.9)	14.24 (12.90)
Non significant	88 (14.1)	
Weight Concern		
Clinically significant	570 (91.3)	7.36 (7.26)
Non significant	54 (8.7)	

TABLE 2. Associated factors with the mean global score of eating disorder questionnaire.

Factor	Mean (SD)	*P* value
Gender		
Male	1.77 (1.69)	**0.033**
Female	2.04 (1.89)	
Faculty		
Medicine	1.76 (1.66)	**0.005**
Dentistry	2.22 (2.00)	
Industrial science	1.63 (1.66)	
Year of study		
1	2.23 (2.03)	**0.006**
2	2.14 (1.89)	
3	1.59 (1.66)	
4	1.80 (1.68)	
5	1.57 (1.45)	
Marital status		
Married	1.49 (2.02)	0.615
Single	1.97 (1.84)	
Nationality		
Malaysian	1.97 (1.85)	0.079
Non-Malaysian	1.10 (.55)	
Race		
Malay	1.96 (1.82)	0.157
Chinese	1.60 (1.83)	
Indian	2.21 (1.45)	
Indonesian	1.75 (1.77)	
Bumiputera	3.29 (2.52)	
Accommodation		
With parent	2.22 (1.99)	**0.001**
Hostel	1.72 (1.64)	
Rented house	0.77 (1.28)	
Family income		
≤ Rm 5000	1.99 (1.81)	0.213
RM 5000 -9999	1.77 (1.78)	
≥ RM 10000	2.10 (1.92)	
Level of distress		
Normal	1.36 (1.37)	**0.000**
Mild	1.86 (1.57)	
Moderate	1.96 (1.79)	
Severe	3.06 (2.29)	
BMI level		
Underweight	.85 (.98)	**0.000**
Normal	1.92 (1.85)	
Overweight	3.41 (1.60)	
Obese	3.47(1.52)	
Social support		
Low support	2.47 (2.36)	**0.045**
Moderate support	2.07(1.87)	
High support	1.79 (1.72)	

TABLE 3. Correlation of variables with eating disorder.

Variable	Correlation Coefficient	*P*-value
Psychological distress	0.37	**0.000**
Social support	-0.13	**0.002**

TABLE 4. Predictors of eating disorders in multiple linear regression analysis.

Variable	β	t	95% Confidence Interval for B		Significant (p<0.05)
			Lower bound	Upper bound	
Age	0.02	0.24	-0.17	0.21	0.812
Gender	-0.64	-1.59	-0.59	0.61	**0.011**
BMI	0.01	0.50	0.00	0.00	0.615
Psychological distress	0.21	4.61	0.03	0.06	**0.000**
Social support	-0.12	-3.18	-0.32	-0.07	**0.002**

DISCUSSION

COVID-19 pandemic affected all aspects of people's lives including restriction of leaving home and staying indoors for long durations which lead to reduction in physical activity and higher levels of stress due to fear of getting infected and separation from family and friends. These circumstances can affect eating habits either by unhealthy coping mechanisms like stress eating while on the other hand some people can become more health conscious and seek to eat healthy food, restrict certain types of food and increase physical activity. Subsequent to this we can expect eating disorders to increase during this pandemic.

This study found that 14.9% of students suffer from an eating disorder, which is lower than the prevalence rates found in previous studies done during COVID-19 pandemic which were 46.5%, 23.5%, 57.51%.[22-25] There are several reasons for the lower prevalence of eating disorders in our study from previous studies like the use of different study tool with different cut-off scores, different durations of sample collection or different waves of COVID-19 pandemic. Another important reason is cultural differences that play an important role in the beliefs and actions of people towards the pandemic and its outcomes. The EDE-Q questionnaire is regarded as a valid and reliable instrument for assessing eating disorder due to its high internal consistency reliability (= 0.93), acceptable test-retest reliability over 14 days, and acceptable equivalence reliability of its items.[25]

In patients with eating disorders during the pandemic, there was an increase in EDs symptoms, as well as anxiety, depression, and changes in BMI as demonstrated by a study in Canada.[26] Studies conducted all over the world on the topic of the correlation between gender and eating disorders yielded conflicting findings. Most research has found that women are more likely to suffer from eating disorders.[27,28] Consistent with previous research, this study found a significant gender difference where females showed significantly higher mean global scores in EDE-Q which could be attributed to inappropriate compensatory behaviours, such as bulimic ED, body checking or body avoidance, and binge eating.

In our study, age also appears to be a significant factor, where participants younger than 22 years showed higher mean EDE-Q scores. In a previous study[29], this trend of score decline with advancing age was also demonstrated. In the same study, age was not statistically significant in multiple linear regression analysis similar to our findings. The same result can be observed in years of study, which may be directly correlated with age, but other factors,

such as the level of distress in each year of study, can also be considered.

As BMI increases, the influence of BMI on eating disordered behaviour grows. This study showed a significant association between overweight and obese participants with higher EDE-Q global mean score. This finding is similar to previous studies.[29,30] Another research among medical students in Iraq showed that many students with normal BMI have eating disorder this difference in results may be due to the use of different tool for assessing eating disorders.[23]

In a previous study they found that BMI was a significant predictor of disordered eating through regression mode.[31] However there was no statistically significant regression model between BMI and EDE-Q score in our study suggesting that there is no correlation between BMI and eating disorders during the COVID-19 pandemic.

In multiple linear regression analysis, psychological distress appears to be one of the most important significant factors contributing to disordered eating, with a significant upward trend across all groups. A person with a high level of psychological distress is more likely to engage in emotion-oriented coping, which may result in higher levels of disordered eating.[31] Multiple variables, including coping mechanisms and social support, can be linked to high levels of distress. In our study, psychological distress was positively correlated with eating disorder, whereas social support was negatively correlated, indicating that these two variables are in some way interrelated. When there is a high level of social support, it may act as a stress buffer and protective barrier in relation to the psychological distress level of students,[32] This correlation of variables indicates that social support is essential for preventing increased psychological distress levels, which may also prevent students from exhibiting symptoms of psychological distress such as depression, anxiety, and eating disorders.

CONCLUSION

High rates of eating disorders exist among undergraduates. Females, younger students, those with a high level of emotional disturbances, a high BMI are associated with eating disorders. Poor perceived social support and emotional disturbances are potential predictors for eating disorders.

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Effectiveness of Repetitive Peripheral Magnetic Stimulation for Treatment of Mild to Moderate Carpal Tunnel Syndrome: A Randomized Controlled Trial

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ABSTRACT

Objective: This study aimed to evaluate the effectiveness of active repetitive peripheral magnetic stimulation (rPMS) compared to sham rPMS on symptoms severity and functional status among patients with mild to moderate carpal tunnel syndrome.

Materials and Methods: A randomized controlled trial was conducted. Participants were randomly allocated (1:1) to either intervention (active rPMS) or control (sham rPMS) groups. Both groups received rPMS (A20 mode of OPTIMUS Pro) for 10 min, once a week for four weeks (four sessions). Symptom severity scales (SSS) and functional status scales (FSS) of Boston Carpal Tunnel Questionnaire were measured at baseline (before session one) and at the end of treatment (after session four). The relative changes in SSS and FSS scores were calculated as a clinical outcome.

Results: Forty-two participants were enrolled and randomly allocated to either the intervention (n = 21) or control group (n = 21). There were no statistically significant differences in the median (interquartile range) of relative changes in SSS [0.05 (0.15) vs 0 (0.27), P = 0.41] or FSS [0 (0.25) vs 0 (0.11), P = 0.97] between the intervention and control groups.

Conclusion: Active rPMS did not improve clinical outcome compared to sham rPMS among patients with mild to moderate CTS. A greater number of subjects and treatment sessions might be required for the future study.

Keywords: Repetitive peripheral magnetic stimulation; carpal tunnel syndrome; median neuropathy at the wrist; non-surgical treatment (Siriraj Med J 2023; 75: 488-493)

INTRODUCTION

Carpal tunnel syndrome (CTS) or median neuropathy at the wrist is the most common compressive neuropathy with a prevalence of 2-3% in the general population.[1] Patients with CTS might have hand numbness or pain along the median nerve distribution. In severe CTS, thenar weakness and/or atrophy can be found. Although CTS can normally be diagnosed by symptoms and physical examinations, nerve conduction studies (NCS) can provide a diagnostic test for CTS in cases where patients have uncertain presentations.[2] Furthermore, NCS can determine the severity of CTS based on electrophysiological findings.[3]

In patients with mild to moderate CTS, non-surgical treatment options such as a neutral wrist splint, corticosteroid injection should be considered. In cases of severe CTS associated with axonal loss, or patients that have not

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responded to non-invasive treatments, surgical release of the transverse carpal ligament is indicated.[4]

Repetitive peripheral magnetic stimulation (rPMS) is a novel physical modality that uses pulsed high-intensity magnetic field to stimulate muscles or nerves. The advantages of rPMS include that it is painless, easy to administer, and allows non-invasive deep tissue penetration.[5] The clinical applications of rPMS in the literature encompass treatment of pain conditions (e.g., myofascial pain, chronic low back pain, neuroma/nerve entrapment) and sensorimotor impairments (e.g., stroke, traumatic brain/spinal cord injury, traumatic brachial plexopathy).[5-7]

Although rPMS is used to treat neuropathy or plexopathy,[8] its clinical evidence as a non-surgical treatment specifically for CTS is limited. There was a preliminary study that evaluated the effectiveness of rPMS (8 wrists) compared to transcutaneous electrical nerve stimulation (TENS; 7 wrists).[9] Both rPMS and TENS were applied for 20 min once a day, three days a week for four weeks. This previous study found that rPMS was not more effective compared to TENS. However, the sample size of this study was too small to derive conclusive results, and no sham stimulation was performed as a control. Hence, the present study aimed to determine whether active rPMS improves clinical outcomes compared to sham rPMS.

MATERIALS AND METHODS

Participants and study design

This study was a randomized, sham-controlled trial conducted at Phramongkutklao Hospital in Bangkok, Thailand, from August 2020 to February 2022. Thai adults (20 to 79 years) who had signs and symptoms of CTS and electrophysiological findings of mild (peak sensory latency > 4.0 ms with normal motor study of median nerve) to moderate (motor latency > 4.5 ms with normal amplitude of compound muscle action potential and preserved sensory action potential of median nerve) degree of CTS were eligible to participate in the present study. If the participants had bilateral CTS, the most affected side was chosen. However, patients who had contraindications to rPMS, such as the use of a cardiac pacemaker; other neurological diseases such as cervical radiculopathy, polyneuropathy; and cognitive impairments were excluded.

Randomization

A computer-generated randomization list in a block of four was generated by an independent researcher before the beginning of enrollment. The random allocation sequence was concealed by an opaque envelope. Participants who met eligibility criteria were randomly assigned 1:1 to receive either active (Intervention group) or sham (Control group) rPMS.

Ethical Consideration

The trial protocol was approved by the Institutional Review Board of the Royal Thai Army Medical Department (Number R174h/63) and was registered in the Thai Clinical Trials Registry (TCTR20210209012). All participants gave their written informed consent before participating in the study.

Interventions

The rPMS machine in the present study was OPTIMUS Pro (REMED, Gyeonggi-do, South Korea) which has magnetic flux density of three Tesla. All participants received 10 min electromagnetic stimulation in A20 mode once a week for four consecutive weeks (four sessions).[10] The round coil rPMS transducer was placed horizontally on the volar side of the affected wrist for the intervention group, but it was applied vertically for the control group, as shown in Fig 1. The intensity of rPMS was gradually increased to the highest level that the patient could tolerate for the intervention group, while it was adjusted to 20% to make the sound of stimulation for the control group. Furthermore, all participants in both groups were advised to avoid hyperflex/extension of the wrist and use a night splint if possible and were allowed to receive cointerventions as desired.

Outcome measure

The outcome measure was the Boston Carpal Tunnel Questionnaire (BCTQ). It is a self-administered questionnaire consisting of two scales: the Symptom Severity Scale (SSS; 11 questions) and the Functional Status Scale (FSS; 8 questions). Each question is rated on the Likert scale from 1 (no) to 5 (the worst) with a higher score indicating greater severity/difficulty. The mean score for each scale was calculated. The Thai version of BCTQ showed good internal consistency for both SSS (Cronbach's alpha of 0.86) and FSS (0.84).[11] BCTQ was evaluated at baseline (before session one) and at the end of treatment (after session four). The relative changes [(pre-treatment score – post-treatment score)/pre-treatment score] in the mean SSS and FSS score were used as clinical outcomes. Participants who had relative changes of ≥ 0.3 were defined as responders to rPMS treatment.[12]

Statistical analysis

With a significant level of 5% and a power of 80%,

Fig 1. Coil position/orientation for each group.

32 participants (16 participants for each group) were required to detect a 0.1 difference in the mean of the relative changes in the SSS or FSS score with a variance of 0.01 between two groups. Estimating a dropout rate of 20%, the target sample size was 40 participants (20 participants per group).

Categorical variables including age group, gender, affected side, severity of CTS, BMI, and treatment result were reported as number and percentage, while continuous variables such as SSS and FSS score at baseline were described as median (min – max). To determine statistical difference in variables between treatment groups, Fisher's exact test was used for categorical data, while the Mann-Whitney test was used for continuous data. Statistical significance was considered where $P < 0.05$. All statistical analyses were based on the intention-to-treat principle.

RESULTS

A total of 50 patients were eligible to participate in the present study. However, three patients were excluded due to radiculopathy, polyneuropathy, and a history of wrist fracture. Two patients refused to participate in this study due to transportation difficulties. From the remaining patients, 42 completed follow-ups for a 4-week period, with 21 patients in the intervention group and 21 patients in the control group (Fig 2).

Of these 42 participants, 90.5% were female; 52.4% were categorized within the age group of 40-59 years; and 73.8% were graded as having moderate CTS. There were no statistically significant differences in age, gender, CTS severity, body mass index (BMI), or pre-treatment SSS or FSS scores between both groups ($P > 0.05$). These details are provided in Table 1.

After the four-week program, there were no statistically significant differences in the median (interquartile range) of relative changes in the SSS [0.05 (0.15) vs 0 (0.27), $P = 0.41$] or FSS score [0 (0.25) vs 0 (0.11), $P = 0.97$] between the intervention and control groups (Fig 3). According to the relative changes in the SSS score, only five participants (11.9%) were categorized as responders: two participants (9.5%) in the intervention group and three participants (14.3%) in the control group ($P = 1$), while no participants were classified as responders based on the relative changes in the FSS score. Furthermore, in the subgroup analysis of participants who had pre-treatment SSS score of at least 2 (eight in the intervention group and seven in the control group), no statistically significant differences were found in the median (interquartile range) of pre-treatment SSS score [2.3 (0.4) vs 2.5 (0.4), $P = 0.22$] and relative changes in the SSS score [0.04 (0.26) vs 0.07 (0.32), $P = 0.82$] was found between the intervention and control groups. Lastly, adverse effects were not found or reported from any of the study participants.

DISCUSSION

The objective of this study was to determine the effectiveness of rPMS for the treatment of CTS. The present study found that active rPMS did not improve

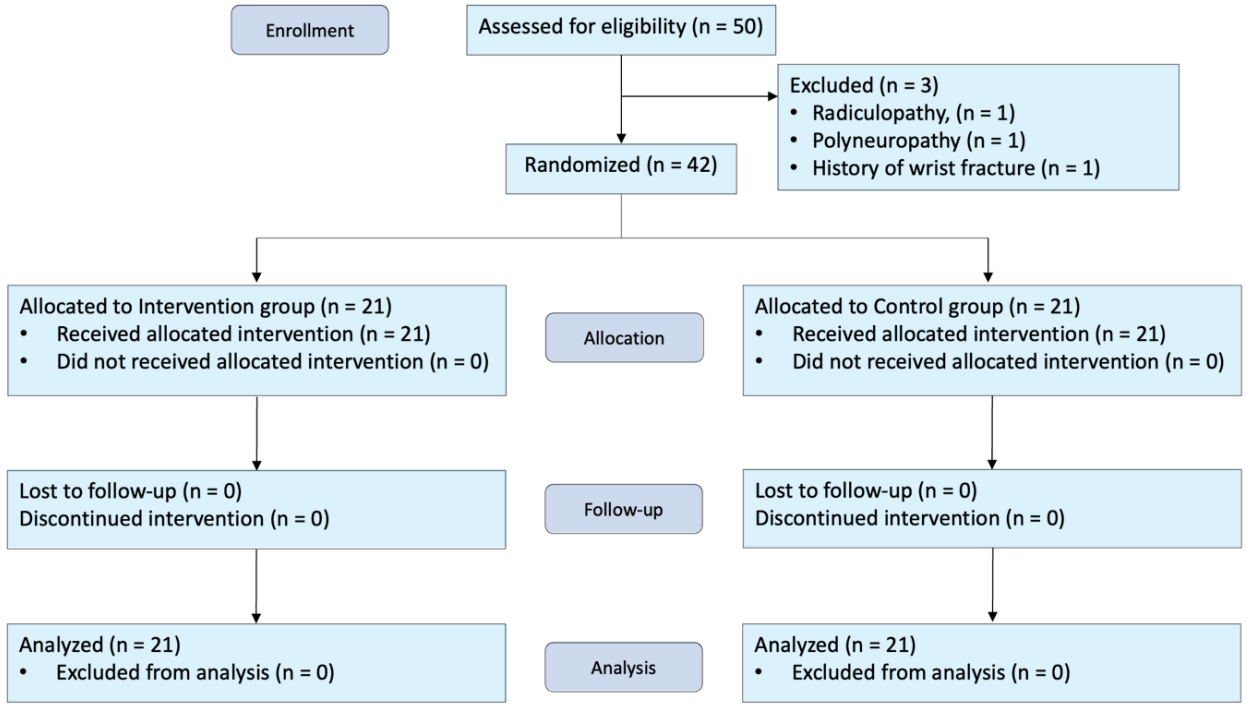

Fig 2. CONSORT diagram of the present study

TABLE 1. Demographic data of participants.

Variables	Intervention group (n=21)	Control group (n=21)	P-value
Age group, n (%)			
40 – 59	10 (47.6)	12 (57.1)	0.76
60 – 79	11 (52.4)	9 (42.9)	
Gender, n (%)			
Male	0 (0)	4 (19)	0.11
Female	21 (100)	17 (81)	
Affected side, n (%)			
Left	5 (23.8)	4 (19)	1.00
Right	16 (76.2)	17 (81)	
CTS Severity, n (%)			
Mild	3 (14.3)	8 (38.1)	0.16
Moderate	18 (85.7)	13 (61.9)	
BMI, n (%)			
< 27	20 (95.2)	18 (85.7)	0.61
≥ 27	1 (4.8)	3 (14.3)	
BCTQ-SSS, median (min – max)	1.8 (1.3 – 2.9)	1.7 (1.3 – 2.7)	0.89
BCTQ-FSS, median (min – max)	1.1 (1 – 2.4)	1 (1 – 1.9)	0.13

Abbreviations: CTS, Carpal tunnel syndrome; BMI, Body mass index, BCTQ, Boston Carpal Tunnel Questionnaire; Symptom Severity Scale, SSS; FSS, Functional Status Scale.

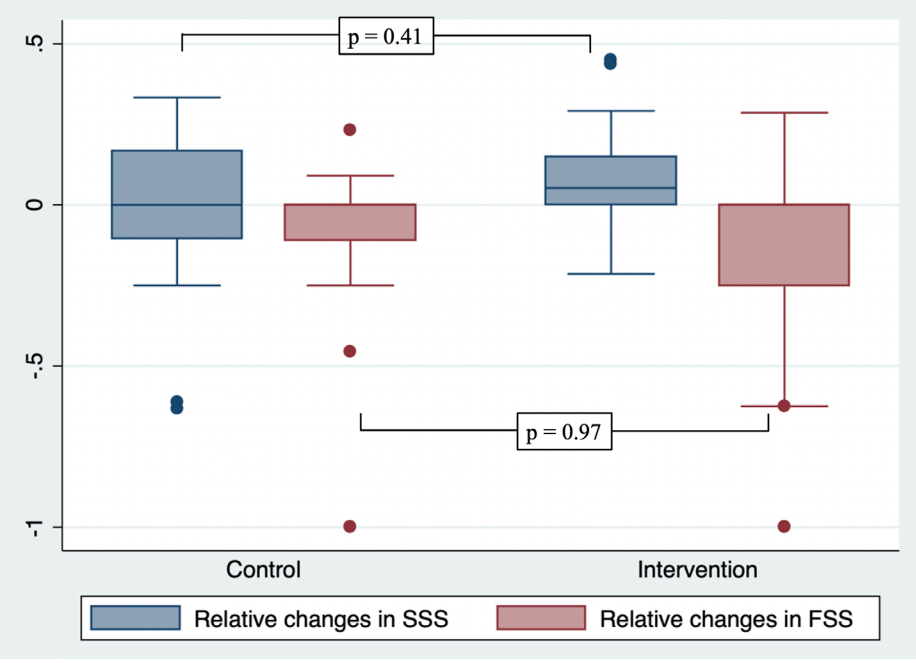

Fig 3. Relative changes in the Symptom Severity Scale (SSS) and the Functional Status Scale (FSS) of both groups

clinical outcomes compared to sham rPMS at the end of 4-week treatment in patients with mild to moderate CTS in both overall and subgroup analyses. To compare with previous studies, so far, no sham-controlled trials have been conducted to determine the effectiveness of rPMS in patients with CTS. However, a small clinical trial was conducted (11 patients) in Korea to determine the effectiveness of rPMS (8 wrists) compared to TENS (7 wrists). The result of this previous study showed that the change in BCTQ score after treatment between these two modalities was not significantly different ($p = 0.97$).[9]

Based on the comparison of SSS scores between active and sham rPMS in this study, it appears that rPMS is an ineffective physical modality to reduce the clinical symptoms of CTS. This result may be because rPMS is used primarily to treat pain conditions. However, most patients with mild to moderate CTS have no or minimal pain but usually present with numbness or tingling. Moreover, although rPMS could have a temporary positive effect for patients with CTS due to eliciting excitability of muscles and nerves under the transducer leading to changes in neuronal functions and neuroplasticity,[13] it was unable to correct the pathophysiology of CTS caused by a compression mechanism resulting in local swelling and dysfunctions of the median nerve in the wrist.[14] Therefore, it could not have the therapeutic (long-term) effect in cases of compressive neuropathy. Furthermore, most of the participants did not have functional problems with their hands, with a median FSS score of 1, as seen in Table 1. This is possibly a key reason why an improvement in the FSS score was not observed in this study.

The present study used the A20 mode with a preset frequency of 8-25 Hz as advised from the manufacturer's recommendation for the control of neuropathic pain. The recommended duration of treatment for this mode was 10-20 min. Hence, in this study, treatment duration for both groups was 10 min, while average (standard deviation) duration of treatment across previous studies was 13.4 (8.8) min.[5] However, the present study was unable to calculate the total number of stimuli because the manufacturer did not provide the details of the duty cycle and the duration of ON/OFF periods of the A20 mode.

In clinical trials for rPMS, standard protocols of sham stimulation have not been established. The orientation of the transducer at a 90 degree angle to the body surface (vertical) was able to reduce the effects of rPMS applied to the target sites.[15] The vertical orientation of the transducer with low stimulation intensity was used in the present study; thus, the sham group should not receive the effects of rPMS even though a real transducer was used. Moreover, two clinical trials evaluating the effects of rPMS on pain among patients with lumbosacral spondylosis or low back pain used this control protocol.[16,17]

Several limitations of this study should be considered. With a relatively small sample size, the results must be interpreted with caution because of the low power of the statistical tests. Most of the participants also had a very mild symptom that might be the reason for the negative results of this study. For this reason, the subgroup analysis was conducted, and it seemed to be similar to the results from the overall analysis. The immediate effect of rPMS on clinical outcomes was not evaluated after

each treatment session. Furthermore, there was only one outcome measure (BCTQ) in this study. Evaluation of objective outcomes, such as grip strength, could be useful in determining the positive effect of rPMS. Lastly, the present study provided rPMS to participants only once a week for four weeks, which might not be enough to improve the clinical symptoms of CTS patients.

CONCLUSION

Active rPMS with preset frequency of 8-25 Hz for 10 min, once a week for four weeks, did not improve clinical outcomes compared to sham rPMS among patients with mild to moderate CTS. However, a greater number of participants and treatment sessions might be considered for future work.

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Readmission Rate of Outpatient Distal Radius Fixation Surgery with Brachial Plexus Block and Midline Pronator Quadratus Approach in the COVID-19 Era: A Retrospective Case Series Report in a Secondary Care Hospital in Thailand

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ABSTRACT

Objective: To demonstrate the readmission rate after distal radius fixation surgery performed with a brachial plexus block and the midline pronator quadratus approach in an ambulatory manner in a secondary care hospital.

Materials and Methods: This retrospective study analyzed data on distal radius fracture patients treated with ambulatory surgery. The patients were enrolled from 1 January 2020 to 28 February 2022, which was during the COVID-19 pandemic. The primary outcome was the readmission rate within 30 days after the surgery. The secondary outcomes were complications, postoperative pain, radiographic outcome, and functional score. All patients were followed up for at least 1 year after the surgery.

Results: Thirty-one patients were enrolled in this study. Their mean age was 58.5 years, and the fractures were mainly caused by low-energy trauma. No postoperative complications were reported, and no readmission after surgery was observed. Overall radiographic parameters were in the acceptable range (radial inclination = 21.9, radial height = 10.26, volar tilt = 2.65, and ulna variance = 1.33). All patients returned to their preinjury statuses within 5 months.

Conclusion: Distal radius fixation surgery can be managed in an ambulatory manner with a low readmission rate, even in secondary care hospitals. This repair technique provides adequate soft tissue coverage of the volar radius plate while decreasing the risk of iatrogenic radial artery injuries.

Keywords: Distal radius fracture; pronator quadratus repair; distal radius plate; osteosynthesis (Siriraj Med J 2023; 75: 494-500)

INTRODUCTION

According to a recent network meta-analysis, fractures of the distal radius treated with volar locking plate fixation tend to have superior outcomes to fractures treated with other methods.[1,2] Fixation surgery can be performed as an ambulatory procedure using an advanced technique such as "wide awake local anesthesia no tourniquet" (WALANT).[3] Performing distal radius fixation surgery in an ambulatory manner decreases hospital occupation rates while ensuring that fractures indicated for surgery are adequately treated. These benefits are particularly significant during the COVID-19 era when hospital beds must be preserved for patients suffering severe respiratory failure.[4,5] However, only a few hospitals in Thailand perform distal radius fixation surgery on an outpatient basis.

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The volar Henry approach is the mainstay for open reduction and internal fixation of the distal radius.[6-8] The pronator quadratus (PQ) muscle is classically incised at its most radial attachment to access the fracture site.[9,10] Although the subsequent repair of the PQ muscle protects the flexor tendons from attrition due to plate prominence, the procedure is technically demanding.[9,11] In the classic volar Henry approach, the PQ muscle is incised close to the radial border of the radius bone. Occasionally, however, the muscle is not amenable to repair by suturing.[7] Additionally, incising the PQ muscle at the radial border may cause iatrogenic radial artery injury and, in turn, postoperative bleeding, a common reason for readmission after surgery. These potential drawbacks influence surgeons to perform the surgery on an inpatient basis.

A mid-belly approach makes distal radius fracture repair more suitable for ambulatory surgery and decreases iatrogenic neurovascular structure injury. The mid-belly technique ensures that there is adequate soft tissue to repair. Additionally, using monofilament suture material to avoid cutting through muscle gives reliable strength at the repair site. This study reports the results of 31 cases of operated distal radius fixation surgery performed as an ambulatory procedure during the COVID-19 era.

MATERIALS AND METHODS

This retrospective study analyzed data on distal radius fracture patients treated with ambulatory surgery at the Golden Jubilee Medical Center, a secondary care hospital in Thailand. The patients were enrolled from 1 January 2020 to 28 February 2022 during the COVID-19 pandemic. The inclusion criteria were as follows: isolated closed distal radius fracture, aged 18 or older, community ambulator, no contraindication for surgery, no allergy to the anesthetic drug, no cognitive impairment, and accompanied by a caregiver on the day of surgery. The indications for surgery were distal radius fractures that were unstable or demonstrated inadequate reduction. "Unstable fractures" were defined as those that were unable to maintain a reduction or had dorsal comminution or intra-articular involvement. The following radiographic parameters defined an adequate reduction: radial height > 5 mm, radial inclination > 15°, volar tilt from 15° to neutral, ulnar variance < 2 mm, and articular step-off or gap < 2 mm. After counseling, the patients selected the treatment option: conservative treatment with a cast, surgical treatment on an inpatient basis, or surgical treatment as an ambulatory procedure. Only patients who elected to undergo ambulatory surgery were enrolled in this study.

Surgical procedure

Ultrasound-guided axillary brachial plexus block is the anesthetic method of choice. Each patient was placed in the supine position, with the head turned away from the arm to be blocked. The arm was abducted to 90 degrees, and the elbow was flexed. After skin preparation, a transducer was placed in the short axis orientation just distal to the axilla, enabling identification of the axillary artery and the nerves surrounding it. A 5-cm 22-gauge needle was advanced (in-plane technique) until the tip was adjacent to the targeted nerve. An incremental, slow injection was administered, with the frequent aspiration of the local anesthetic drug to avoid intravascular injection. The goal was to deposit local anesthetic around the axillary artery and the musculocutaneous nerve. A subcutaneous injection just distal to the axilla was performed to block the intercostobrachial nerve. The combination of intercostobrachial nerve block and intravenous sedation helped the patient tolerate tourniquet pain.

The modified Henry approach was performed, with the skin incision made above the flexor carpi radialis muscle. The flexor carpi radialis tendon was retracted to access the deep fascia (Fig 1a). After blunt dissection, the PQ muscle was fully visualized above the radius bone. A sharp, full-thickness cut at the mid-belly of the PQ muscle was made deep to the radius bone to access the fracture site (Fig 1b). To keep the muscle brim sharp and repairable, the PQ muscle was meticulously detached subperiosteally to form a muscle flap. The articular surface was reduced under a fluoroscope by accessing the fracture site via the metaphysis and lifting the fracture fragments to restore the articular surface. The volar ulnar corner and distal radioulnar joint were comfortably accessible, with little muscle belly obstructing the surgical site. With this reduction technique, the joint capsule proximal to the watershed line was preserved (Fig 2a). After volar locking plate placement, the PQ muscle was closed using monofilament absorbable suture material to minimize soft tissue trauma. The mid-portion of the PQ muscle and the thick underlying periosteum were sutured using the figure-of-8 closure technique to avoid cut-through of the muscle. The PQ muscle was repaired from the distal to the proximal end to ensure adequate distal coverage (Fig 2b). The subcutaneous tissue and skin were subsequently closed.

Postoperative protocol

Postoperatively, dry dressing, compression dressing with a cotton wrap, and conformable stretch bandaging were applied to the surgical wound. Each patient was counseled about postoperative care and advised to visit

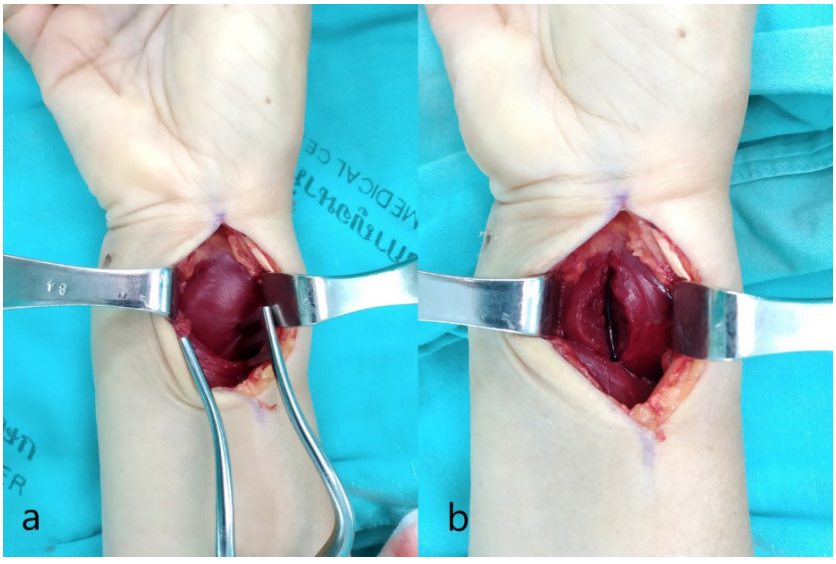

Fig 1a. The flexor carpi radialis tendon was identified and retracted to access the deep fascia. The pronator quadratus muscle was identified by excising the deep fascia and bluntly dissecting the soft tissue.

Fig 1b. A full-thickness dissection of the pronator quadratus muscle was undertaken at the mid-belly portion to access the fracture site. The incision is recommended at the mid-portion of the radius bone or slightly ulnar to gain improved visualization of the lunate facet.

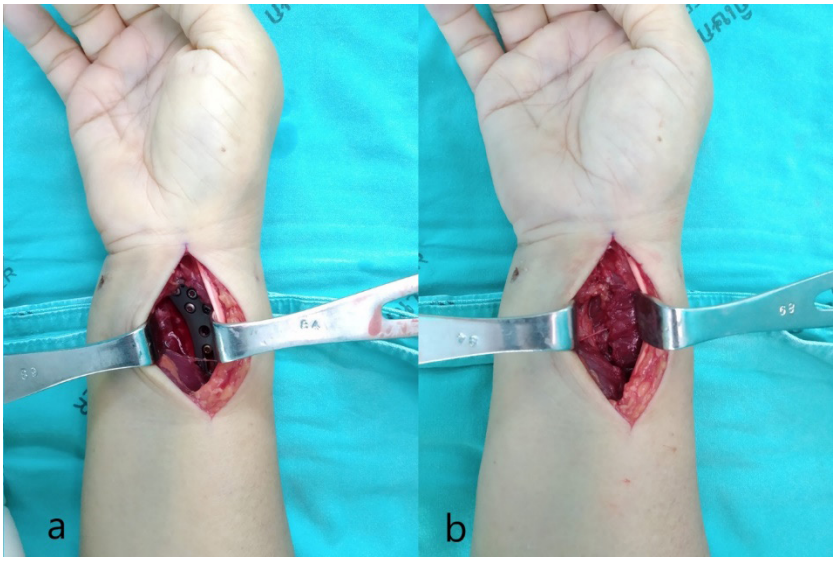

Fig 2a. The plate position should be proximal to the watershed line. Limited exposure to the distal musculotendinous junction is recommended if the reduction is successful with the closed technique.

Fig 2b. A monofilament absorbable suture is recommended for repair of the pronator quadratus muscle. Appropriate tension and approximation facilitate the repair process and ensure adequate distal coverage

the hospital if complications developed. Wrist motion was allowed immediately after surgery. The patient was requested not to carry heavy objects during the first postoperative month but was encouraged to increase weight bearing gradually, as tolerated, afterward.

Data collection

Patient demographic data were obtained. Any postoperative complications and the readmission rate within 30 days after the surgery were ascertained from operative notes and medical records. Per the surgical protocol, postoperative pain was evaluated by phone calls within the 3-day postoperative period. Immediate postoperative radiographs were obtained before each patient was discharged (Fig 3). Removal of the stitches and routine wound care were performed during the first follow-up visit (2 weeks postoperatively). Radiographic evaluations of the fracture fixation were performed at routine follow-ups until callus formations were noted. The functional outcomes were evaluated by the Quick Disabilities of the Arm, Shoulder, and Hand (QuickDASH) questionnaire at each follow-up. Pain sensation was evaluated with a visual analog scale.

Statistical analysis

Demographic data are reported as the means and standard deviations for continuous data, while categorical data are presented as frequencies and percentages. The readmission rate, the primary outcome, is reported as the number of cases and percentages. The postoperative complications are reported in the same manner as categorical data. Visual analog scale scores, radiographic parameters, and Quick-DASH scores are reported as the means with standard deviations.

RESULTS

The study enrolled 31 patients who underwent distal radius fixation surgery in an ambulatory manner. Their

Fig 3. Preoperative radiographs were obtained to facilitate surgical planning. This representative preoperative radiograph (top row) shows a fracture categorized as Type III under the Fernandez classification system. The subsequent postoperative radiograph (bottom row) shows decreased articular stepping and adequate volar tilt of the distal fragment.

mean age was 58.5 years, and most patients were female. The most common injury mechanism was low-energy trauma, and the affected side was indifferent, being either right or left. Most patients had a fracture pattern with an American Orthopedic/Orthopedic Trauma Association classification of 2R3A3. Other demographic data are detailed in Table 1.

None of the 31 cases in this study were readmitted. The average operative time was 95.58 minutes, and the average intraoperative bleeding volume was 6.2 ml. The PQ muscle was successfully repaired in all 31 cases with adequate plate coverage, skin closure, and no plate prominence. No immediate postoperative complications

Fig 4. This picture demonstrates the postoperative surgical wound at 2 weeks. A minimal hematoma was observed, with no surgical-site infection reported.

were reported, and no hematomas or surgical wound complications were noted at the 2-week follow-up (Fig 4).

One patient came for an early follow-up visit with swelling of the hand that had been operated on as the chief complaint. After counseling and advising the patient to perform active finger motion with the appropriate arm position, the patient's symptoms were relieved. The patient attended the subsequent scheduled follow-up visit. Another 5 patients had postoperative numbness, but their symptoms had resolved by 8 weeks postoperatively. Although most of the 31 patients had wrist stiffness 4 weeks after surgery, their wrist motion had returned to normal by 8 weeks after surgery. In addition, callus formations were noted in plain radiographs 8 weeks postoperatively. No revision surgery or postoperative infections were found in this study.

Most of the radiographic parameters were in an acceptable range. The mean radial height was restored to 10.26 mm along with radial inclination (mean = 21.97°). Most patients' distal radii were reduced in neutral to slightly volar flexion in the lateral view, with minimal to no articular stepping and a slightly positive ulnar variance

TABLE 1. Demographic data of the patients.

Variable	N	% of sample
Age		
Mean = 58.6 ± 11.05 years		
≤ 40	1	3.2%
41-60	16	51.6%
> 60	14	45.2%
Sex		
Male	8	25.8%
Female	23	74.2%
Mechanism of injury		
Low energy	27	87.1%
High energy	4	12.9%
Affected side		
Rt.	15	48.4%
Lt.	16	51.6%
AO classification: 2R3		
A2	4	12.9%
A3	14	45.2%
B2	1	3.2%
C1	6	19.4%
C2	4	12.9%
C3	2	6.5%
ASA classification		
1	14	45.2%
2	15	48.4%
3	2	6.4%
Time to surgery (days)		
Mean = 10.3 ± 4.6		
≤ 5 4	12.9%	
6 - 15	22	70.9%
>15	5	16.2%

(Table 2). The mean QuickDASH scores at the 1-month, 2-month, and 5-month follow-ups were 46.55, 20.44, and 0.6, respectively. During the first night, the patients experienced maximum postoperative pain, which was relieved by oral analgesic drugs. The pain score on the first postoperative day was below 5, decreasing steadily thereafter.

DISCUSSION

Distal radius fixation surgery is one of several feasible orthopedic procedures for ambulatory surgery. Ambulatory or day surgery is appropriate and feasible in secondary care hospitals or higher. A peripheral nerve block or local selective nerve block is adequate for intraoperative pain control. Although the postoperative complications are quite low, the commonly reported causes of readmission are postoperative pain and bleeding complications. A meticulous surgical approach and an appropriate anesthetic technique are essential for reducing complications and readmission rates.

The volar Henry approach is the mainstay for the osteosynthesis of distal radius fractures. Although recent studies have shown no significant differences in functional outcomes[12,13], most surgeons prefer to repair the PQ muscle after plate fixation to ensure coverage and prevent flexor tendon rupture.[8,9,11,14] The classic volar

TABLE 2. Postoperative radiographic parameters of the affected distal radius.

Variable	N	% of sample	Mean	Median
Incline			21.97 ± 3.2	22.0
< 20	9	29%		
> 20	22	71%		
Radial height (mm)			10.3 ± 1.4	10.5
≤ 10	12	38.7%		
> 10	19	61.3%		
Tilt			2.65 ± 4.8	4.0
≤ 0	10	32.3%		
> 0	21	67.7%		
Step (mm)			0.24 ± 0.6	0
= 0	26	83.9%		
> 0	5	16.1%		
Variance (mm)			1.33 ± 1.9	1.7
≤ 0	10	32.3%		
> 0	21	67.7%		

Henry approach is preferred to incise the PQ muscle at the radial-most attachment at the musculotendinous junction. An incision too close to the radial border leaves a small tendinous attachment that is typically challenging to repair and risks iatrogenic radial artery injury.[6]

The principle of the authors' technique is based on the anatomic repair of the PQ muscle. Through meticulous subperiosteal elevation of the PQ muscle, the intact periosteum reinforces the muscle belly, thereby maintaining the belly's integrity and strengthening the muscle edge. Furthermore, the monofilament absorbable suture material helps to decrease soft tissue trauma, thus further increasing the muscle's integrity after suturing. Moreover, by using the figure-of-8 closure technique as the first suturing knot, the sharp edge of the PQ muscle is held appropriately. The tension force is also decreased by holding the forearm in the semipronated position. Both of these outcomes facilitate the repair process.

Coverage of the most distal portion of the PQ muscle is problematic for all current techniques for repairing the muscle.[8,9,11] Because the watershed area lacks a muscle belly[15], coverage by the PQ muscle alone is insufficient in some cases. Adequate reduction is needed to minimize plate prominence at the distal part of the radius.[11,16-18] With a variable angle screw, the plate can be placed proximal to the watershed area with satisfactory screw placement.[15]

The integrity and durability of the PQ muscle are topics of interest. Muscle-to-muscle suturing may give a poor result due to the questionable strength and integrity of the repair site.[8,18] Interestingly, 6 patients in this study underwent plate removal after a 1-year follow-up due to patient preference. The intraoperative findings showed intact PQ muscle with full plate coverage (Fig 5). These 6 patients had gained a full range of motion of the affected wrist with no hand-grip strength impairment.

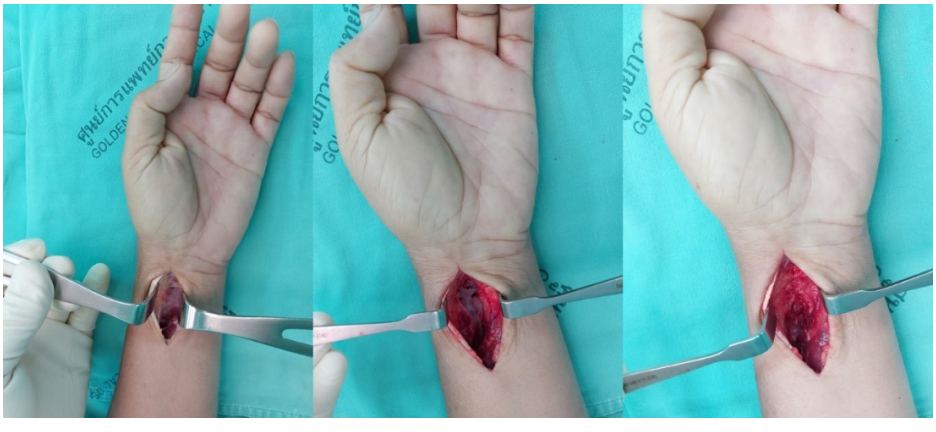

Fig 5. The pronator quadratus muscle was intact, with complete coverage of the distal radius volar locking plate observed during the retrieval surgery. The pronator quadratus muscle was repaired after plate removal.

Good repair of the PQ muscle may also help decrease postoperative hematoma. In this study, postoperative pain was minimal, peaking on the first night after the surgery, and no hematomas or wound infections were reported, which are common reasons for readmission.[19] Pain from the soft tissue trauma was decreased through meticulous soft tissue handling. With the PQ muscle intact after its repair, a hematoma is also limited within a closed space; minimal postoperative bleeding was observed at the 2-week follow-up when the surgical stitches were removed. Further study is needed to determine this effect.

This technique has a limitation based on PQ muscle quality. Old patients with generalized muscle wasting may have insufficient PQ muscle thickness, making the muscle not repairable. Furthermore, severe articular comminution is not amendable with this technique. This is because an extensile approach may be needed, and plate placement needs to be in the watershed area[7,11,15], making it too bulky for coverage. In this situation, brachioradialis tendon coverage[8] or PQ-muscle splitting[9] is an alternative.

CONCLUSION

Distal radius fixation surgery is feasible for ambulatory surgery with minimal postoperative complications or readmission rates. An appropriate anesthetic technique and a meticulous surgical approach are essential to perform the procedure as ambulatory surgery. Meticulous repair of the PQ muscle after mid-belly splitting gives adequate coverage with promising durability in selected patients. This repair technique provides adequate soft tissue coverage of the volar radius plate while decreasing the risk of iatrogenic radial artery injuries.

Conflicts of interest

All authors declare that there are no personal or professional conflicts of interest and that no financial support was provided by the companies that produced the materials described in this report.

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Effect of Multifocal Intraocular Lens on Contrast Sensitivity in Primary Angle-Closure Patients

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ABSTRACT

Objective: To study the effect of multifocal intraocular lens (MIOL) implantation on contrast sensitivity (CS) compared to monofocal intraocular lens (mIOL) in primary angle-closure (PAC) or primary angle-closure glaucoma (PACG) patients.

Materials and Methods: This prospective study included patients with PAC or PACG and visually significant cataract. Phacoemulsification with MIOL or mIOL (patient preference) was performed. Collected data included best-corrected distant visual acuity (BCVA), intraocular pressure (IOP), anterior chamber depth (ACD), and contrast sensitivity (CS) measured at spatial frequency 1.5, 3.0, 6.0, 12.0, and 18.0 cycles per degree (CPD) preoperatively, and at 2-6 months postoperatively. Preoperative and postoperative parameters were then compared.

Results: Of the 45 eyes from 35 patients that were enrolled, 33 eyes (15 PAC, 18 PACG) from 26 patients completed the study. Fourteen eyes (11 patients) received diffractive MIOL, and 19 eyes (15 patients) received aspheric mIOL. Preoperative CS was not significantly different between groups. Postoperatively, BCVA, and CS at each spatial frequency were significantly improved in both groups (all $p<0.001$). Mean postoperative CS at spatial frequency 1.5, 3.0, 6.0, 12.0, and 18.0 CPD was 28.03, 42.63, 44.84, 10.82, and 2.86 in the MIOL group, and 29.55, 49.63, 46.20, 16.83, and 7.09 in the mIOL group, both respectively. Postoperative CS was not significant different between groups at any spatial frequencies. IOP was decreased (p=0.001) and ACD increased ($p<0.001$) postoperatively in both groups.

Conclusion: No significant difference in visual acuity or contrast sensitivity was observed between MIOL and mIOL after cataract removal in patients with PAC/PACG.

Keywords: Effect; multifocal intraocular lens; monofocal intraocular lens; contrast sensitivity; primary angle-closure patients (Siriraj Med J 2023; 75: 501-507)

INTRODUCTION

Primary angle-closure glaucoma (PACG) is responsible for approximately half of all glaucoma blindness worldwide[1]; however, primary angle-closure (PAC) and PACG are more prevalent in Asians[2-4] than in Europeans.[5,6] Cataract surgery with intraocular lens (IOL) implantation in glaucoma eyes has been reported to improve visual acuity, and to reduce postoperative intraocular pressure (IOP) and the number of required medications.[7]

Reduction in IOP and the number of postoperative anti-glaucoma medications was reported to be greater in eyes with PACG than in eyes with open-angle glaucoma or without preexisting glaucoma.[7,8] Phacoemulsification with monofocal intraocular lens (mIOL) provides excellent visual quality, but spectacles are required to improve near vision. Multifocal intraocular lens (MIOL) was reported to achieve good overall vision (both near and distant) with less dependence on spectacles.[9,10] However, patients with MIOL may experience unwanted effects that included glare, halos, and reduced contrast sensitivity

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(CS) compared to mIOL.[11-13] Few studies have reported the use of MIOL in eyes with concurrent ocular diseases, especially glaucoma.[7,10,13] Since both MIOL and glaucoma can decrease CS, a potential interactive effect may limit the use of MIOL in eyes with coexisting cataract and glaucoma.[11,13] However, glaucoma eye with good disease control without visual field defect may benefit from cataract surgery and MIOL implantation.

The aim of this study was to investigate the effect of MIOL implantation on CS compared to mIOL implantation in patients with PAC or PACG.

MATERIALS AND METHODS

This prospective non-randomized clinical study was conducted at the Department of Ophthalmology of the Faculty of Medicine Siriraj Hospital, Mahidol University, Bangkok, Thailand during January 2014 to December 2015. The study protocol and informed consent procedures were both approved by our center's institutional review board (IRB) (COA no. Si 384/2014). Each patient provided written informed consent prior to participation. Visually significant cataract patients aged >18 years with PAC or PACG who underwent prophylaxis peripheral iridotomy at least 2 months prior to participation were eligible for inclusion. Patients with preexisting glaucomatous visual field defect, except generalized depression; with any other concurrent ocular diseases that could affect visual acuity, except cataract; and/or, history of ocular inflammation or ocular surgery, except laser peripheral iridotomy, which is a routine procedure for treating PAC/PACG were excluded.

Primary angle closure was defined as an eye with invisible non-pigmented trabecular meshwork greater than 180 degrees and evidence of peripheral anterior synechiae on gonioscopy or history of increased IOP (>21mmHg) without glaucomatous optic disc appearance, or glaucomatous pattern visual field damage. Primary angle closure glaucoma was defined as an eye with invisible non-pigmented trabecular meshwork greater than 180 degrees on gonioscopy with glaucomatous optic damage (cup-to-disc ratio greater than 0.5 and/or localized neuro-retinal rim defect) and a history of high IOP (>21 mmHg). Patients with PACG must have been under good disease control, which was defined as IOP under 20 mmHg with 1 to 3 topical anti-glaucoma medications without deterioration of visual field, except generalized depression from cataract. The Humphrey visual field testing within 6 months before participation in patient with PACG was used to evaluate the visual field defect. Intra-ocular lens calculation was performed at the baseline visit using IOL Master (Carl Zeiss Meditec, Inc., Dublin, CA, USA). All patients received information about the advantages and disadvantages of MIOLs (Tecnis ZMB00; Abbott Medical Optics, Santa Ana, CA, USA or Acrysof IQ Restore SN6AD1; Alcon, Fort Worth, TX, USA), and of mIOLs (Tecnis ZCB00; Abbott Medical Optics or Acrysof IQ SN60WF; Alcon) before choosing the type of IOL that they individually preferred. Cataract surgery was performed by a single surgeon (NK). Topical anesthesia was applied before standard phacoemulsification (2.2 mm temporal clear cornea incision and continuous curvilinear capsulorhexis) and IOL implantation into the capsular bag. Eyes with any intraoperative or postoperative complication were excluded.

Data specific to uncorrected and best-corrected distant visual acuities (UCVA and BCVA) in logMAR, auto-refraction, slit-lamp ophthalmoscopic examination, intraocular pressure (IOP) measurement with Goldmann applanation tonometry, contrast sensitivity (CS), anterior chamber depth (ACD), central corneal thickness (CCT), and axial length (AL) were collected on the preoperative screening day, and at the 2 to 6-month postoperative follow-up. CS was measured under normal room light (photopic) conditions without glare to evaluate patient quality of vision during the performance of their daily activities using a Functional Vision Analyzer (FVA) (Stereo Optical, Inc., Chicago, IL, USA). This test produces sine-wave gratings of different spatial frequencies. The absolute values of distance CS were obtained at five spatial frequencies (1.5, 3, 6, 12, and 18 cycles per degree; CPD). Visante® AS-OCT (Carl Zeiss Meditec) was used to determine CCT and ACD. ACD was defined as the distance between the corneal endothelium and the anterior surface of the crystalline lens (preoperative) or iris plane (postoperative). Axial length was obtained using IOL Master.

Statistical analysis included descriptive statistics to summarize patient demographic and clinical data. All statistical analyses were performed using SPSS Statistics software (version 16.0 for Windows) (SPSS, Inc.; IBM Corporation, Armonk, NY, USA). Data are described as mean plus/minus standard deviation (SD) for continuous data with normal distribution, and as median and interquartile range (IQR) for non-normally distributed continuous data. Categorical data are described as number and percentage. Comparisons of continuous data with normal distribution were made using Student's t-test for unpaired data, and using Mann-Whitney U test for non-normally distributed data. Categorical data were compared using chi-square test or Fisher's exact test. A p-value of less than 0.05 was defined as denoting statistical significance.

RESULTS

There were 45 eyes from 35 patients with a mean age of 65.7 years enrolled in this study; however, only 33 eyes of 26 patients completed the study. There were 6 males and 20 females. The only reason for exclusion was the inability to complete the preoperative or postoperative CS measurement. Fourteen eyes were PAC, and 19 eyes were PACG. Fourteen eyes from 11 patients received diffractive MIOLs (7 Tecnis ZMB00, and 7 Acrysof IQ Restore SN6AD1), and 19 eyes from 15 patients received aspheric mIOLs (17 Tecnis ZCB00, and 2 Acrysof IQ SN60WF). All patients underwent uneventful cataract surgery and completed at least 2 months of follow-up. Preoperative patient characteristics compared between the MIOL and mIOL groups are summarized in Table 1. There was no statistically significant difference in age, gender, preoperative distance UCVA or BCVA, IOP, CCT, or axial length between the MIOL and mIOL groups, but the MIOL group had significantly more PAC than the mIOL group (p=0.001). The mIOL group had significantly shallower ACD than the MIOL group (p=0.01). Preoperative contrast sensitivity compared between the MIOL and mIOL groups is shown in Fig 1. No statistically significant difference was observed between groups for preoperative CS; however, the MIOL group had lower CS at all spatial frequencies compared to the mIOL group. After phacoemulsification with IOL implantation, the postoperative CS improved significantly at all spatial frequencies in both groups (all $p \leq 0.001$). Postoperative CS compared between the MIOL and mIOL groups is shown in Table 2. The postoperative CS tended to be lower in the MIOL group, but there was no statistically significant difference between groups at any of the evaluated spatial frequencies. Postoperative contrast sensitivity compared between the MIOL and mIOL groups is shown in Fig 2. Postoperative distance BCVA improved significantly in the MIOL group (p=0.013) and the mIOL group (p=0.003). The mean postoperative IOP significantly decreased in the MIOL (p=0.008) and mIOL (p=0.02) groups, and the mean postoperative ACD significantly increased in the MIOL (p=0.048) and mIOL (p=0.001) groups. There was no statistically significant difference in postoperative distance BCVA (p=0.377), IOP (p=0.084), or ACD (p=0.98) between groups. A comparison of preoperative and postoperative ocular parameters in the MIOL and mIOL groups is shown in Table 3.

TABLE 1. Preoperative patient characteristics compared between the MIOL and mIOL groups.

Characteristics	MIOL group (15 eyes) (Mean±SD)	mIOL group (21 eyes) (Mean±SD)	*P*-value
Mean age (years)	66.7±5.5	65.0±8.9	0.701
Gender (male : female)	2:9	4:11	0.385
Diagnosis (eyes) (PAC:PACG)	10:4	4:15	***0.001***
BCVA (logMar)	0.186±0.123	0.221±0.181	0.706
IOP (mmHg)	14.9±1.7	16.6±3.5	0.132
Axial length (mm)	22.4±0.7	22.9±1.0	0.136
ACD (mm)	2.1±0.3	1.8±0.2	***0.010***
CCT (microns)	527.7±40.6	538.4±23.9	0.356
IOL power (diopters)	23.5±2.2	23.14±3.1	0.705
Contrast sensitivity (CPD)*	median (IQR)	median (IQR)	
1.5	9.0 (19.8)	18.0 (22.0)	0.199
3.0	17.3 (29.0)	29.0 (47.0)	0.186
6.0	8.7 (17.3)	12.0 (45.0)	0.287
12.0	0.0 (3.8)	0.0 (11.0)	0.506
18.0	0.0 (0.0)	0.0 (0.0)	0.483

A p-value<0.05 indicates statistical significance (*Mann-Whitney U test)

Abbreviations: MIOL, multifocal intraocular lens; mIOL, monofocal intraocular lens; IOL, intraocular lens; SD, standard deviation; IQR, interquartile range; PAC, primary angle-closure; PACG, primary angle-closure glaucoma; BCVA: best-corrected visual acuity; IOP, intraocular pressure; ACD, anterior chamber depth; CCT, central corneal thickness; CPD, cycles per degree

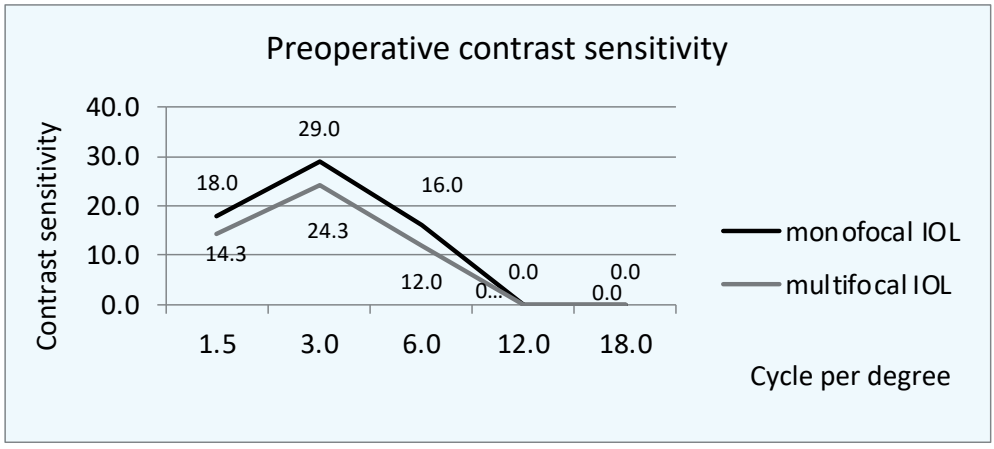

Fig 1. Preoperative contrast sensitivity compared between the multifocal intraocular lens (MIOL) and monofocal IOL (mIOL) groups.

TABLE 2. Postoperative contrast sensitivity compared between the MIOL and mIOL groups.

Spatial frequency (CPD)	MIOL group median (IQR)	mIOL group median (IQR)	*P*-value
1.5	20.4 (18)	25.0 (24.4)	0.377
3.0	30.9 (43.7)	51.3 (27.6)	0.142
6.0	35.0 (48.0)	45.0 (38.3)	0.760
12.0	9.7 (30.0)	10.0 (14.5)	0.602
18.0	2.0 (12.0)	4.0 (5.0)	0.287

A *p*-value<0.05 indicates statistical significance (Mann-Whitney U test)
Abbreviations: MIOL, multifocal intraocular lens; mIOL, monofocal intraocular lens; CPD, cycles per degree; IQR, interquartile range

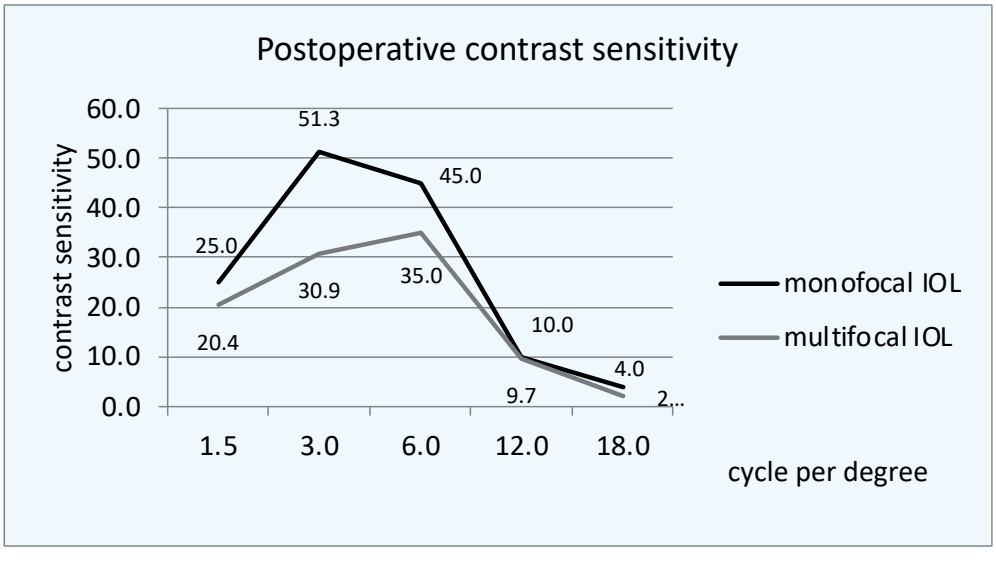

Fig 2. Postoperative contrast sensitivity (median) compared between the multifocal intraocular lens (MIOL) and monofocal IOL (mIOL) groups.

TABLE 3. A comparison of preoperative and postoperative ocular parameters in the MIOL and mIOL groups.

Parameters	MIOL group (Mean±SD)			mIOL group (Mean±SD)			Comparison a and b
	Pre-op	Post-op (a)	*P*	Pre-op	Post-op (b)	*P*	*P*
BCVA (logMAR)	0.186±0.123	0.093±0.073	***0.013***	0.221±0.181	0.074±0.099	***0.003***	0.377
IOP (mmHg)	14.9±1.7	12.5±2.5	***0.008***	16.6±3.5	14.3±2.8	***0.020***	0.084
ACD (mm)	2.1±0.3	3.0±0.1	***0.048***	1.8±0.2	3.1±0.3	***0.001***	0.98

A *p*-value<0.05 indicates statistical significance (Mann-Whitney U test)
Abbreviations: MIOL, multifocal intraocular lens; mIOL, monofocal intraocular lens; BCVA, best corrected visual acuity; IOP, intraocular pressure; ACD, anterior chamber depth

DISCUSSION

Cataract surgery with mIOL implantation generally results in improved CS in patients with and without glaucoma.[13] The results of the present study demonstrate that cataract surgery with MIOL or mIOL implantation can improve CS in patients with PAC/PACG. It was not until the 1980s that MIOLs started being used for cataract surgery. Several studies confirmed that MIOLs provide good near and distance visual acuity, more spectacle independence, and high patient satisfaction.[14] In contrast, MIOLs can also produce unwanted optical effects, including halos, glare, and decreased CS.[11,15-17] A decrease in resolution of visual quality associated with MIOLs is measured by reduced CS. Multifocal optics distribute light through several foci, so CS is reduced and glare disability increased when the image of a distance focus is overlapped by the out-of-focus images generated from the multifocal design.[18] The increased depth of focus experienced after MIOL implantation is usually obtained at the expense of image clarity. However, it has been proposed that this reduction in CS may be significant in eyes with preexisting impairment of CS.[19]

The positive effect of cataract surgery on CS may be to some degree negated by a loss of CS at low spatial frequencies after MIOL implantation. In our study, the postoperative CS improved significantly in patients who received MIOLs, and the postoperative CS of MIOLs was comparable to those of mIOLs. Few studies have demonstrated the benefits of MIOLs in eyes with concomitant ocular disease, especially glaucoma.[10] To our knowledge, this is the first study to report the use of MIOLs in angle-closure eyes. There are some anatomical characteristics associated with age and angle-closure, such as short axial length, thick pigmented iris, and increased thickness of the crystalline lens.[20] Cataract surgery in angle closure provides the opportunity to 'kill two birds with one stone' by restoring vision and eliminating a narrow angle.[21] Cataract surgery also helps to prevent or delay progression along the PAC spectrum, and reduces the incidence of PACG, particularly in regions where angle-closure is prevalent.[7]

Improvement in glaucoma control after cataract surgery was reported, and the observed improvement was found to be more pronounced in angle-closure than in open-angle glaucoma.[7,14] Our study demonstrates the positive effect of cataract surgery in PAC/PACG, including deepening of the ACD and IOP reduction. Deepening of the ACD and relief of the crowding angle were hypothesized to result in improvement of aqueous outflow with subsequent IOP reduction.[14,22] It should be noted that we included only PAC and PACG with mild glaucomatous optic neuropathy and well-controlled IOP without significant visual field loss in order to reduce the likelihood of VF progression after cataract surgery. Teichman and Ahmed recommended considering some specific glaucoma patients as candidates for MIOL implantation, including glaucoma suspects, ocular hypertensive patients without optic disc or visual field damage, and well-controlled glaucoma patients with early or mild visual field damage.[11] Our study showed improvement in postoperative visual acuity, and there was no significant difference in uncorrected distance visual acuity between the MIOL and mIOL groups. This same finding was previously reported from a study that compared MIOLs and mIOLs in nonglaucomatous eyes.[14] The present study found the postoperative CS to be highest at 3 CPD in the mIOL group, and at 6 CPD in the MIOL group. CS was lower in the MIOL group

than in the mIOL group at all spatial frequencies (1.5-18 CPD), especially at 3 CPD, but the difference was not statistically significant. Kim, *et al*. reported CS outcome to be significantly lower in the MIOL group than in the mIOL group.[12] However, those previous studies investigated the performance of previous spherical MIOLs. With the introduction of aspheric MIOLs, some of the loss of CS may be ameliorated.[14] The mIOLs used in this study were aspheric IOLs, which reduce spherical aberration by counteracting corneal sphericity that increases with aging. The MIOLs were diffractive aspheric IOLs, which have a posterior diffractive surface to decrease spherical aberration produced by multifocality resulting in less CS loss.[14]

Even though eyes with MIOLs were previously reported to experience reduced CS, this loss is not perceived as functionally significant in normal eyes, and it is counterbalanced by improvement in CS from cataract surgery, uncorrected near visual acuity, and depth of focus.[23] Furthermore, patients with cataract and glaucoma may have already grown accustomed to preoperative CS reduction, which increases the likelihood that they would not notice or be affected by the small loss of CS from MIOLs.[19,24] This suggests that the slight decrease in CS in the MIOL group compared to the mIOL group in our study may not be clinically significant.

This study has several limitations. First, we were forced to exclude several patients who were unable to produce reliable CS, either preoperatively or postoperatively, due to the complicated CS testing process. This resulted in our having a much smaller sample size than we had anticipated. Second, the IOL models used in this study included 2 different models in each group, and these two different models may exert different effect on CS. Third, we did not test binocular visual function, which may cause negative or positive effect on visual quality and patient satisfaction. Fourth and last, the follow-up CS measurement was performed during the short-term follow-up when there was no posterior capsular opacity and/or completed brain adaptation – both of which could affect CS and visual quality.

In conclusion, cataract patients with PAC or mild PACG may be considered for cataract surgery with MIOL implantation because they have high potential for good IOP control, less chance of VF progression, and may even become disease-free after surgery. MIOL implantation in the setting of PAC/early stage PACG improved visual acuity and CS even though it caused a non-statistically significant loss of low contrast acuity compared to mIOL. However, the loss of low contrast acuity was apparently without clinical significance, and may have been an acceptable trade-off to gain enhanced near vision. A randomized controlled study in a larger study population should be conducted to evaluate the long-term effects of MIOLs on CS, visual quality, and patient satisfaction among patients with PAC/PACG.

Conflict of interest declaration

All authors declare no personal or professional conflicts of interest relating to any aspect of this study.

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All named authors meet the International Committee of Medical Journal Editors (ICMJE) criteria for authorship for this article, take responsibility for the integrity of the work as a whole, and have given their approval for this version to be published.

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Neuroimaging Findings in Acquired Esotropia Patients at Siriraj Hospital from 2009–2020

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ABSTRACT

Objective: To analyze the neuroimaging findings in patients with acquired esotropia at Siriraj Hospital from 2009 to 2020.

Materials and Methods: A retrospective review of the medical records of all patients aged above 6 months old who presented with acquired esotropia was done. All the patients had an angle of deviation ≥ 10 prism diopters (PD), refraction < +3.0 diopters (D), and had neuroimaging performed. The patients with restrictive myopathy and extraocular neurological abnormalities were excluded from the study.

Results: In total, 177 subjects aged between 8 months old to 81 years old (mean age 32.35 ± 24.40 years old) were included in the study. The patients' demographic data, ocular findings, and neuroimaging findings were collected. The mean angle of deviation at near and distance were 26.88 ± 18.90 PD and 29.81 ± 17.25 PD, respectively. Of the 177 cases, 113 cases (63.8%) had no neuroimaging abnormalities, while 64 cases (36.2%) had abnormal neuroimaging findings. In those 64 cases with abnormal findings, there were 16 intracranial tumors, 6 inflammations, 4 vascular lesions, 7 degenerations, and 31 other lesions. Sixth nerve palsy was found to be significantly different between the positive and negative neuroimaging group from both the uni- and multivariate analysis.

Conclusion: Although more than half of acquired esotropia patients had no abnormalities in neuroimaging, but 14.7% of those with abnormal neuroimaging findings had underlying serious conditions, which consisted of intracranial tumors, inflammation, and vascular lesions. Special attention should be concentrated to patients with sixth nerve palsy as it was the significant factor found to be associated with positive neuroimaging findings in acquired esotropia.

Keywords: Acquired Esotropia; neuroimaging (Siriraj Med J 2023; 75: 508-512)

INTRODUCTION

Esotropia is a type of strabismus characterized by the inward deviation of the eye. It can be classified based on its onset as either infantile esotropia, which occurs within the first 6 months of life, and acquired esotropia, which occurs after this period.[1] Acquired esotropia had been initially classified as accommodative and non-accommodative types.[2,3] Burain and Miller[4] further subdivided acute acquired non-accommodative esotropia (AACE) into Swan type, Burian–Franceschetti type, and Bielschowsky type.[5,6] Although acquired esotropia is less common than its congenital counterpart, it can be associated with life-threatening conditions.[5,7] In a study by Cruysberg JR. et al., neurological risk was reported to be equal in comitant and incomitant acquired esotropia.[8] Dotan G. et al suggested that neuroimaging is suggested in young patients presented with isolated sixth nerve palsy to detect intracranial tumor early.[9] Nevertheless, the decision to perform neuroimaging in patients is still complex as previous reports have provided conflicting recommendations.[10-18] Furthermore, most studies have focused solely on acute acquired comitant esotropia (AACE) type[18,19] or patients with sixth nerve palsy. In Thailand, neuroimaging is commonly performed in all

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patients with acquired esotropia, but the incidence and prevalence of life-threatening conditions associated with this acquired esotropia are not well documented. Therefore, the aim of this study is to determine the prevalence and factors associated with abnormal neuroimaging findings in all types of acquired esotropia, excluding the accommodative type, in Thai patients receiving treatments at Siriraj Hospital between 2009 and 2020. The goal is to provide additional information to support the appropriate use of neuroimaging in patients with acquired esotropia.

MATERIALS AND METHODS

The medical records of all patients diagnosed with esotropia at Siriraj Hospital from January 2009 to December 2020 were reviewed. The inclusion criteria were an onset of esotropia ≥ 6 months of age, angle of deviation ≥ 10 PD, refraction < +3.0 D, and had imaging of the brain and/or orbit performed. The exclusion criteria were restrictive myopathy and having extraocular neurological signs. This study was approved by Siriraj Institutional Review Board Certificate of Approval (COA no. Si 497/2021).

The collected data included the patients' demographic characteristics, ophthalmological examination (visual acuity, anterior segment examination, posterior segment examination, and angle of deviation at near and distance) and neuroimaging findings. The analysis was performed using descriptive statistics (numbers and percentages, Chi-square test, and Fisher's exact test) and analytic statistics (univariate and multivariate logistic regression).

RESULTS

In total, 177 cases that presented with acquired esotropia at 8 months to 81 years of age (mean 32.35 ± 24.40 years old) were included in the study. The duration of acquired esotropia ranged from 1 day to 520 weeks (mean 58.83 ± 91.98 weeks). All the demographic data and ocular findings are summarized in Table 1. There were 93 male cases (52.5%) and 84 female cases (47.5%). The mean angle of deviation at distance and near were 29.81 ± 17.25 PD and 26.88 ± 18.90 PD, respectively. The study identified various abnormal ocular findings. Sixth nerve palsy was the most frequently observed condition, with a total of 54 cases, while nystagmus and ptosis were each observed in 2 and 1 cases, respectively. Additionally, decreased vision was reported in 6 cases, and abnormalities of the anterior segment were detected in 2 cases. Optic disc atrophy was found in 5 cases, while optic disc edema and optic disc anomaly were identified in 2 and 3 cases, respectively.

Table 2 provides a comprehensive list of the neuroimaging modalities used in the study, which included both CT and MRI scans. The neuroimaging results revealed various pathologies, including 16 cases of tumors, 6 cases of inflammation, 4 cases of vascular conditions, 7 cases of degeneration, and 31 cases of other conditions (Fig 1). Types of tumors observed in this study are listed in supplement 1. The study identified older age, hypertension, diabetes mellitus, dyslipidemia, sequelae of stroke, coronary artery disease and sixth nerve palsy as factors that differed significantly between patients with positive neuroimaging results and those with negative results, with a p-value of less than 0.001. However, only sixth nerve palsy remained statistically significant in the multivariate analysis. Other ocular abnormalities revealed no significant differences between the two groups.

The authors conducted a subgroup analysis (Supplement 2) to investigate the association factors of patients in different age groups: under 18 years old, aged 19-60 years old, and over 60 years old. The analysis showed that the proportion of patients with abnormal imaging findings was significantly higher in older age group (p-value <0.001). Among the different age groups, positive findings were significantly associated with decreased visual acuity in patients under 18 years of age, sixth nerve palsy and early onset of less than 6 months in patients aged 19-60 years old, and hypertension in patients over 60 years old.

As the study by Buch H. et al.[16] identified age over 6 years as a factor related to intracranial lesions, subgroup analysis of patients with early onset (< 6 months) and those with onset over 6 months was further done. Patients with positive findings had a higher incidence of older age, hypertension, and sixth nerve palsy in both groups.

DISCUSSION

A total of 177 cases with a diagnosis of acquired esotropia were identified over a 12-year study period. Interestingly, the majority of patients belonged to the age group of 19-60 years. This finding contrasts with previous studies in the Thai population, such as the study by Montriwet M. et al[19], which found over 70% of patients in age group below 18 years (mean age 10.8 ± 8.6 years) among 41 patients with AACE. Another study by Lekskul A. et al[18], which investigated 30 patients with AACE, reported a higher mean age but still much lower than our studies (mean of age 22.9 ± 16.1 years and 32.35 ± 24.40 years, respectively). This difference could be related to the varied types of acquired esotropia in this study. The mean angle of esodeviation at distance and near were comparable with many precedent studies[18,20], but lower with several studies.[19,21] The differences could be related to the older age of patients in this study, as

TABLE 1. Demographic data and ocular findings.

Characteristics & signs	Total N (%)	Negative findings N (%)	Positive findings N (%)	P value
Gender (n=177)				
Male	93 (52.5)	58 (51.3)	35 (54.7)	0.667
Female	84 (47.5)	55 (48.7)	29 (45.3)	
Age group (n=177)				
0-18 years	70 (39.5)	**53 (46.9)**	17 (26.6)	
19-60 years	**75 (42.4)**	49 (43.4)	**26 (40.6)**	**<0.001***
More than 60 years	32 (18.1)	11 (9.7)	21 (32.8)	
Comorbidities (n=167)				
No	111 (66.5)	84 (76.4)	27 (47.4)	
Yes	56 (33.5)	26 (23.6)	30 (59.6)	**<0.001***
Hypertension	24 (14.4)	7 (6.4)	17 (29.8)	**<0.001***
Diabetes Mellitus	18 (10.8)	7 (6.4)	11 (19.3)	**0.016***
Dyslipidemia	15 (9.0)	5 (4.6)	10 (17.5)	**0.009***
Sequalae of stroke	5 (3.0)	1 (0.9)	4 (7.0)	**0.047***
Coronary artery disease	5 (3.0)	0 (0.0)	5 (8.8)	**0.004***
Malignancy	3 (1.8)	1 (0.9)	2 (3.5)	0.269
Previous brain injury	4 (2.4)	3 (2.7)	1 (1.8)	1.000
Ocular neurological signs (n=164)				
Normal	106 (64.6)	82 (79.6)	24 (39.3)	
Abnormal	58 (35.4)	21 (20.4)	37 (60.7)	<0.001*
CN VI palsy	54 (32.9)	19 (18.5)	35 (57.4)	**<0.001***
Nystagmus	2 (1.2)	1 (1.0)	1 (1.6)	1.000
Ptosis	1 (0.6)	0 (0.0)	1 (1.6)	0.372
Visual acuity (n=159)				
Normal	153 (96.2)	99 (98.0)	54 (93.1)	0.192
Decreased	6 (3.8)	2 (2.0)	4 (6.9)	
Anterior segment (n=148)				
Normal	146 (98.6)	94 (99.0)	52 (98.1)	1.000
Abnormal	2 (1.4)	1 (1.0)	1 (1.9)	
Mean angle of esodeviation				
At distance (n=119)	29.81 ± 17.25	30.74 ± 17.65	28.04 ± 16.48	0.362
At near (n=111)	26.88 ± 18.90	27.03 ± 18.20	26.57 ± 20.43	0.893
Optic disc (n=150)				
Normal	130 (86.7)	83 (86.5)	47 (87.0)	
Abnormal	20 (13.3)	13 (13.5)	7 (13.0)	1.000
Disc pallor	5 (3.3)	3 (3.1)	2 (3.7)	1.000
Disc edema	2 (1.3)	1 (1.0)	1 (1.9)	1.000
Disc anomaly	3 (2.0)	2 (2.1)	1 (1.9)	1.000

P-values were obtained by Chi-square or Fisher's exact test. Values with asterisk are results that are statistically significant.

TABLE 2. Neuroimaging modalities.

	N (%)
CT brain with contrast	68 (38.4)
CT brain and orbit with contrast	21 (11.9)
MRI brain and orbit	20 (11.3)
MRI brain	20 (11.3)
MRI and MRA brain	12 (6.8)
CT brain and orbit	12 (6.8)
CT brain without contrast	11 (6.2)
CTA brain	4 (2.3)
CT orbit	4 (2.3)
MRI and MRV brain	2 (1.1)
MRI orbit	1 (0.6)
CT and CTA brain and orbit	1 (0.6)
CT brain, orbit and neck with contrast	1 (0.6)

Abbreviations: CT = computed tomography, CTA = computed tomography angiography, MRI = magnetic resonance imaging, MRA = magnetic resonance angiography, MRV = magnetic resonance venogram.

the mean of deviation decrease with age.[21] Furthermore, although papilledema and optic disc pallor have been reported to be associated with intracranial neoplasms[22,23], our study did not find a significant difference in the prevalence of these features between the groups with positive and negative neuroimaging findings.

Despite the commonly held belief that acquired esotropia is a benign condition, recent research has revealed the potential for serious neurological pathologies even in patients with normal neurological examination.[5,24-27] In this study, 113 cases (63.8%) displayed normal neurological findings, while 26 cases (14.7%) were diagnosed with life-threatening conditions such as tumors, inflammation, and vascular lesions. Additionally, degeneration and other pathologies were observed in 38 cases (21.5%). Among the 26 cases with serious conditions, intracranial tumors were the most frequently observed, accounting for 9% of the cases. This proportion was found to be lower than that reported in sixth nerve palsy patients[9,13], but higher than that observed in studies of AACE patients.[16-18]

The present study observed a higher prevalence of hypertension, history of cerebrovascular diseases, advanced age, and sixth nerve palsy among patients with positive and serious neuroimaging findings, which is consistent with previous reports.[10,16,18] However, in the multivariate analysis, only sixth nerve palsy demonstrated a statistically association. These findings provide additional evidence supporting the recommendation to perform neuroimaging in patients presenting with sixth nerve palsy.[9,12,13]

This study is the first study which investigation focused in all types of acquired esotropia except accommodative type in Thai population. Nevertheless, there are several limitations that must be acknowledged, including the retrospective design of the study and a small sample size. Further research using a randomized-controlled trial approach, larger sample size, and comparison each acquired esotropia type, ocular findings and imaging modalities may yield more definitive conclusions regarding of acquired esotropia patients.

CONCLUSION

In the current study, more than one-third (36.2%) of the patients diagnosed with acquired esotropia had abnormal neuroimaging results. Furthermore, among these cases, 14.7% had underlying serious central nervous

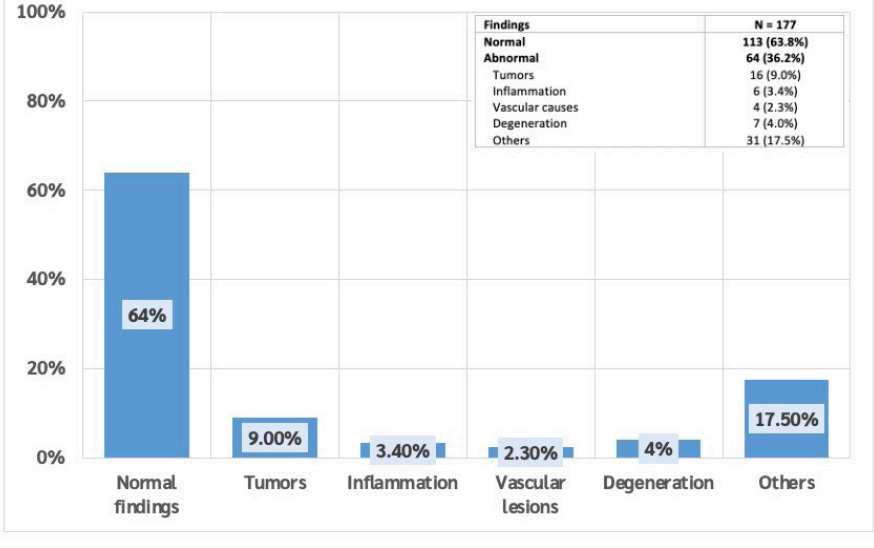

Fig 1. Neuroimaging findings.

system conditions, including tumors, inflammation, and vascular lesions. Sixth nerve palsy was revealed to be a significant factor associated with positive neuroimaging findings. Therefore, patients presenting with sixth nerve palsy should be carefully examined and closely monitored as it is an ocular sign that may relate with serious intracranial lesions.

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Prevalence and Factors Associated with Post-operative Strictures in Anorectal Malformations

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ABSTRACT

Objective: Rectal strictures are a serious complication following operation for anorectal malformations (ARM). The purpose of this study was to determine the factors affecting rectal strictures following surgical treatments for ARM.

Materials and Methods: Retrospective chart reviews of 204 patients with ARM who underwent surgical treatment at Siriraj Hospital between January 2003 and December 2019 were carried out.

Results: Overall, the prevalence of post-operative rectal stricture was 19.6% (40/204). The higher types of ARM had higher rectal stricture rates. In low type ARM, the stricture rate following surgery for perineal fistula, vestibular fistula was 4.1% and 14.7%, respectively. Recto-bulbar urethral fistula and recto-prostatic urethral fistula had stricture rates of 19.2% and 26.7%, respectively, but in higher types, the stricture rates were above 70%. Complications such as wound infection, dehiscence, retraction, colonic necrosis and recurrent fistula all affected the post-operative stricture rate ($p = 0.029$, $p = 0.01$, $p = 0.01$, $p = 0.042$ and $p = 0.002$, respectively). The operation for low type ARM using local tissue flap, such as YV and cutback anoplasty, had low complications. More complicated operations were performed for higher type ARM. The higher the complication rate, the higher the post-operative rectal stricture. Routine rectal dilatation by parents seemed to prevent rectal strictures ($p = 0.056$). The surgical treatments for rectal strictures composed of 57.5% anoplasty, 17.5% PSARP, 15% abdo-assisted pull-through and 10% abdo-assisted PSARP.

Conclusion: Post-operative rectal stricture occurred because of complications following complicated operations for high type ARM. A meticulous operative technique is crucial.

Keywords: Stricture; stenosis; complication; anorectal malformation; ARM (Siriraj Med J 2023; 75: 513-521)

INTRODUCTION

Postoperative stricture of the rectum is a serious complication following operation for anorectal malformations (ARM). The prevalence of postoperative stricture ranges from 3%-35%.[1-4]

Stricture of the neo-rectum is caused by many factors, such as:

1. Rectum devascularization during mobilization of the rectum[3] caused dehiscence, retraction and serious infection.

2. Types of surgery. Each operation for anorectal malformations has different rates of stricture. Anal transposition[5] has a 11% stricture rate, whereas posterior sagittal anorectoplasty (PSARP), which is the standard operation[6,7] performed for non-low types anorectal malformation, have a 6% stricture rate.[4] Meanwhile, internal sphincter-saving posterior sagittal anorectoplasty (ISSA) has a 30% chance of severe rectal stricture.[4]

3. Type of anorectal malformation. Even within the same type of operation, such as posterior sagittal anorectoplasty, the rates of rectal strictures are different. Rectal strictures are more common in recto-bulbar urethral fistula, recto-bladder neck fistula, and cloacal malformation.[2]

4. Non-strict adherence to rectal dilatation protocols.[1,3,8]

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Two weeks after surgical treatment for anorectal malformation, dilatation of the reconstructed anus with a Hegar dilator is commenced. *Peña A*.[6-8] a world authority on anorectal malformations, recommends dilation of the anus with a series of Hegar dilators following the protocol.[1] *Peña A*. believes that rectal strictures are caused by non-strict adherence to the rectal dilatation protocol.[1] However, a study reported that daily dilatation of the rectum is not necessary, but rectum size could be calibrated every week by the surgeon.[9]

Post-operative dilatation is routinely done to avoid rectal stricture. The initial remedy of rectal stricture is treatment by dilating the rectum. If treatment by dilating the rectum does not improve symptoms, subsequent treatment is an operation. The method to correct these rectal strictures include redo-anoplasty, redo-PSARP, redo pull-through, etc.[3,4] Rectal stricture is cited in up to 40% of children who require re-operation for anorectal malformations or Hirschsprung's disease.[1,3]

In this study, rectal stricture was defined as: 1) patients who underwent any type of surgical correction as a result of rectal stricture following surgical treatment for anorectal malformations, or 2) severely constipated patients due to a rectal stricture, resulting in a megacolon which required a subsequent megacolon resection.

The purpose of this study was to determine factors affecting rectal stricture after surgical treatments for anorectal malformation. These factors included complications following surgery such as dehiscence, retraction, wound infection, type of anorectal malformation, type of surgery, and the practice of dilating the anus according to the protocol.[8] Moreover, this study also elucidates on surgical treatments for rectal stricture. When factors affecting rectal strictures are clarified, it can be reduced or prevented.

MATERIALS AND METHODS

Following approval from the Siriraj Institutional Review Board, (COA. No Si 377/2020), a retrospective study was conducted in children with anorectal malformations who underwent surgical corrections for anorectal malformations at Siriraj Hospital between January 2003 and December 2019, regardless of the hospital where the patient had a colostomy. Children with cloacal exstrophy, Hirschsprungs's disease, major chromosomal anomalies incompatible with life, incomplete medical records, and those who failed to follow-up at Siriraj Hospital were excluded from this study.

Demographic data, presence of colostomy, type of ARM and operation, operative records, post-operative complications, the practice of dilating the anus according to the protocol, and operative treatments for stricture correction were analyzed. Types of ARM and operation were compared between those with rectal strictures and those without stricture. Complications including wound infection, wound dehiscence, wound retraction, colonic necrosis, recurrent fistula, mucosal prolapse and anastomosis leakage, were also compared between those with rectal strictures and those without stricture. The practice of anal dilatation according to the protocol by parents was recorded and compared. Operative treatments for rectal stricture correction were analyzed. A Chi square test or Fisher's exact test was used to compare proportions between the groups for qualitative evaluation, including type of anorectal malformation, type of surgical treatment, complications such as dehiscence, retraction, infection, etc. Data was analyzed using the PASW Statistics program (SPSS Inc. Released 2009. PASW Statistics for Windows, Version 18.0. Chicago: SPSS Inc.). Continuous data was expressed as median and IQR, and categorical data as number and percentage. All data was analyzed in two-way and a p-value of <0.05 indicated statistical significance.

RESULTS

Between January 2003 and December 2019, 204 patients with anorectal malformations underwent surgical correction at the Division of Pediatric Surgery, Department of Surgery, Siriraj Hospital, Mahidol University, Thailand. Demographic data of all patients was compared, and the results of those without post-operative stricture and those with post-operative stricture are shown in Table 1.

In this study, the definition of rectal stricture was either: 1) patients who underwent any form of surgical correction as a result of rectal stricture or 2) severely constipated patients with a megacolon and subsequent megacolon resection.

One hundred and twenty-eight patients (62.7%) were male and 76 patients (37.3%) were female. Gender had no impact on post-operative stricture ($p = 0.609$). The median age at surgery for anorectal malformation in those without rectal stricture and those with rectal stricture was 3.9 months and 7.5 months, respectively ($p < 0.008$).

Overall, the prevalence of post-operative rectal stricture was 19.6% (40/204). The prevalence of post-operative stricture in each type of anorectal malformation is demonstrated in Table 2. Each type of ARM has a different stricture formation rate. Higher types of anorectal malformation have higher rectal stricture rates. In low type anorectal malformations, stricture formation following surgery for perineal fistula, and vestibular fistula occurred in 4.1% and 14.7% of patients, respectively. In high type

TABLE 1. Demographic data of all patients comparing between those without post-operative stricture and those with post-operative stricture was shown.

Characteristics	Non - stricture (n = 164)	Stricture (n = 40)	Total (n = 204)	P - valve
Gender, n (%)				
Male	101 (61.6%)	27 (67.5%)	128 (62.7%)	0.609
Female	63 (38.4%)	13 (32.5%)	76 (37.3%)	
Age at definite operation (months); median ± IQR	3.9 ± 8.1	7.5 ± 6.3	4.6 ± 8.8	0.008
Age at follow up (years); median ± IQR	4.2 ± 4.9	5.6 ± 4.7	4.5 ± 4.9	0.054
Duration of treatment(months); median ± IQR	67.6 ± 54.8	50.1 ± 54.6	54.0 ± 55.4	0.054

TABLE 2. Prevalence of post-operative stricture in each type of anorectal malformation.

Types of anorectal malformation	Total N = 204	Stricture n (%)
Perineal Fistula	49	2 (4.1%)
Vestibular Fistula	34	5 (14.7%)
Imperforate Anus Without Fistula	31	0 (0%)
Recto-bulbar Urethral Fistula	26	5 (19.2%)
Recto-prostatic Urethral Fistula	30	8 (26.7%)
Recto-bladder Neck Fistula	17	12 (70.6%)
Persistent Cloaca < 3 Cm	15	6 (40.0%)
Persistent Cloaca ≥ 3 Cm	1	1 (100.0%)
Rectal Atresia	1	1 (100.0%)

anorectal malformations, recto-bladder neck fistula had a stricture rate of 70.6%. Meanwhile, persistent cloaca (>3 cm) and rectal atresia had a 100% rectal stricture rate. Anorectal malformations in these two groups, such as recto-bulbar urethral fistula and recto-prostatic urethral fistula, had stricture rates 19.2% and 26.7%, respectively.

A comparison of the type of anorectal malformations in those without and those with postoperative strictures of the rectum is shown in Table 3. Recto-bladder neck fistula had a statistically significant high percentage of strictures ($p < 0.001$). The types of anorectal malformation which had a statistically significant low percentage of stricture were perineal fistula ($P = 0.003$) and imperforated anus without fistula ($p = 0.006$). A higher ARM type meant more post-operative rectal strictures than the low type.

In non-low type anorectal malformations managed by colostomy, the rate of post-operative rectal strictures is revealed in Table 4. In this group, 129 patients underwent colostomy, with the most common type being loop colostomy (123/129) (95.3%). Divided colostomy was also performed in five patients (3.9%) and other types of colostomy in 0.8% of patients. Sigmoid colostomy is the preferred type and was performed in 120/129 (93%) patients. However, colostomy was performed as an initial operation for non-low type anorectal malformation only. Patients who had undergone a colostomy had

TABLE 3. Types of anorectal malformation: comparison between those without and with postoperative stricture of the rectum.

Types of Anorectal malformation	Non - stricture (n = 164)	Stricture (n = 40)	Total (n = 204)	P - valve
Perineal Fistula	47 (28.7%)	2 (5%)	49 (24%)	0.003
Vestibular Fistula	29 (17.7%)	5 (12.5%)	34 (16.7%)	0.581
Imperforated Anus Without Fistula	31 (18.9%)	0 (0)	31 (15.2%)	0.006
Recto-bulbar Urethral Fistula	21 (12.8%)	5 (12.5%)	26 (12.7%)	1
Recto-prostatic Urethral Fistula	22 (13.4%)	8 (20.0%)	30 (14.7%)	0.421
Recto-bladder Neck Fistula	5 (3%)	12 (30%)	17 (8.3%)	<0.001
Persistent Cloaca < 3 Cm	9 (5.5%)	6 (15%)	15 (7.4%)	0.082
Persistent Cloaca ≥ 3 Cm	0	1 (2.5%)	1 (0.5%)	0.443
Rectal Atresia	0	1 (2.5%)	1 (0.5%)	0.443

TABLE 4. Post-operative rectal stricture in non-low type anorectal malformations patients managed by colostomy before, were revealed.

Operation type	Non-stricture (n=164)	Stricture (n=40)	Total (n=204)	P - value
Colostomy	96 (58.5%)	33 (82.5%)	129 (63.2)	0.008
Non colostomy	68 (41.5%)	7 (17.5%)	75 (36.8)	

more rectal stricture formation than one who had never had a colostomy (82.5% vs 17.5%), and this result had a statistically significant difference. (p = 0.008).

The type of operative treatment for anorectal malformation, and a comparison between those without and those with postoperative strictures of the rectum are shown in Table 5. Each operative technique had a different incidence of stricture. Posterior sagittal anorectoplasty (PSARP), which was the most common procedure, had a stricture rate of 18.5% (15/81 patients) whereas, abdominal assisted PSARP and posterior sagittal anorectovaginourethroplasty (PSAVUP) had a rectal stricture incidence of 55.6% (10/18 patients) and 50% (7/14) patients, respectively. The procedure for high or complex anorectal malformation, such as abdominal assisted PSARP and PSARVUP, had a high rate of rectal stricture with significant statistical difference (P < 0.001 and P = 0.009, respectively). The operations for low type anorectal malformation, which used local tissue flaps such as YV anoplasty and cutback anoplasty, had low incidences of rectal stricture (0% and 5% (1/20)), respectively. Using statistical analysis, this difference between those without and those with strictures in YV anoplasty and cutback anoplasty had a p-value of 0.025 and 0.151, respectively. Anal transposition which complete mobilization of rectum into the proper position had to be performed, had rectal stricture in 6/37 (16.2%) and p value was 0.730.

Comparison of post-operative complications between the group without and with post-operative strictures is shown in Table 6. All complications such as wound infection, wound dehiscence, wound retraction, colonic necrosis and recurrent fistula affected post-operative stricture (p = 0.029, p = 0.01, p = 0.01, p = 0.042 and p = 0.002, respectively).

Complications following an operation, including wound infection, wound dehiscence, wound retraction, colonic necrosis, recurrent fistula, were compared for the type of operation and the results are shown in Table 7. The operations for low type anorectal malformation, which

TABLE 5. Types of operative treatment for anorectal malformation: comparison between those without and those with postoperative stricture of the rectum were demonstrated.

Operation type	Non-stricture (n=164)	Stricture (n=40)	Total (n=204)	P - value
YV anoplasty	23 (14%)	0	23 (11.3%)	0.025
Cutback anoplasty	19 (11.6%)	1 (2.5%)	20 (9.8%)	0.151
Anal transposition	31 (18.9%)	6 (15%)	37 (18.1%)	0.730
Mini-PSARP	3 (1.8%)	0	3 (1.5%)	0.897
PSARP	69 (42.1%)	15 (37.5%)	81 (41.2%)	0.728
Abd assist PSARP	8 (4.9%)	10 (25%)	18 (8.8%)	<0.001
Lap assist PSARP	3 (1.8%)	1 (2.5%)	4 (2.0%)	1.000
PSARVUP	7 (4.3%)	7 (17.5%)	14 (6.9%)	0.009

TABLE 6. Comparison of post-operative complications between groups with and without post-operative stricture.

Complication	Non-stricture (n=164)	Stricture (n=40)	Total (n=204)	P - valve
Wound infection	14 (8.5%)	9 (22.5%)	23	0.029
Wound dehiscence	5 (3.0%)	10 (0.3%)	15	0.01
Retraction	2 (4.2%)	8 (0.3%)	10	0.01
Colonic necrosis	0	2 (0.1%)	2	0.042
Recurrent fistula	0	4 (0.1%)	4	0.002
Mucosal prolapse	29 (17.6%)	11 (0.3%)	40	0.362

TABLE 7. Complications following definite operations including wound infection, wound dehiscence, wound retraction, colonic necrosis, recurrent fistula, were compared among the types of the operation.

Operation	n	Wound infection	Wound dehiscence	Wound retraction	Colonic necrosis	Recurrent fistula
YV anoplasty	23	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Cutback anoplasty	20	0 (0%)	1 (5.0%)	0 (0%)	0 (0%)	0 (0%)
Anal transposition	37	2 (5.4%)	0 (0%)	3 (8.1%)	0(0%)	1 (2.7%)
PSARP	85	9 (10.6%)	2 (2.4%)	3 (3.6%)	0 (0%)	1 (1.2%)
Abd assist PSARP	18	1 (5.6%)	4 (22.2%)	1 (5.6%)	0 (0%)	0 (0%)
PSARVUP	14	4 (28.6%)	3 (21.4%)	(14.3%)	2 (14.3%)	1 (7.1%)

used local tissue flap transfer such as YV anoplasty and cutback anoplasty, had a very low incidence of complication. Anal transposition, which was mostly used for vestibular anus and required mobilization of the rectum into a new position in the center of the sphincter of the anus, had a higher incidence of wound retraction (8.1%) and recurrence of fistula (2.7%) than any other procedure for low type anorectal malformation. Complications following PSARP included wound infection in 10.6% of cases, wound dehiscence in 2.4% of cases, and recurrent fistula in 1.2% of cases. Abdominal assisted PSARP had more complications than PSARP, with wound infection in 5.6% of cases, wound dehiscence in 22.2% of cases, and retraction in 5.6% of cases. PSARVUP had the highest rate of complications overall.

After surgical correction for anorectal malformation, postoperative dilatation was performed to prevent rectal stricture. Routine rectal dilatation by parents was done in 160 patients. A comparison of rectal dilatations according to the protocol[1] in those with and without post-operative strictures are shown in Table 8. Rectal strictures were observed in 28/160 (17.5%) of all cases. Routine rectal dilatation by parents seems to prevent rectal strictures, but the incidence between these two groups has no statistical significant difference ($p = 0.056$). Patients with rectal strictures required a prolonged duration of rectal dilatation and higher frequency of rectal dilatations under general anesthesia than those without strictures ($p = 0.123$ and $p < 0.001$ respectively).

The surgical treatments for rectal stricture in this series composed of anoplasty in 23 patients (57.5%), PSARP in seven patients (17.5%), abdominal assisted pull-through in six patients (15%), and abdominal assisted PSARP in four patients (10%). The mean length of stay of these reoperations was 13 days.

DISCUSSION

Among post-operative complications in cases of anorectal malformation, rectal stricture is a serious complication. A wide variety of studies have reported its prevalence, depending on the type of surgery[3], and type of anorectal malformation. The prevalence of post-operative stricture ranges from 3%-35%.[1-4] Overall, the prevalence of post-operative rectal stricture in our series was 19.6% (40/204).

The cause of rectal strictures can be attributed to the following factors:

1. Complications following treatment for anorectal malformation. Devascularization of the rectum during mobilization of the rectum[3] causes dehiscence and retraction. This problem is caused by improper rectum mobilization. Ischemia of the rectum and excessive tension between the rectum and the skin can also cause rectal strictures.[1,3] The rectum normally has a good intramural blood supply, however, during mobilization of the rectum, in order to obtain an adequate length of rectum for anastomosis, the surgeon can cut the fascia located posterior to the rectum. It is important to dissect close to the rectum wall. If the rectum is injured during dissection, it will lack of intramural blood supply, leading to stricture of the rectum.[8] An operation performed in younger age of patient might cause hypothermia which could probably affect post-operative surgical complications similar to adult's anorectal operations.[10] However, the effect of hypothermia was not examined in this study. In our study, the median age at surgery for anorectal malformation in those with rectal stricture was 7.5 months whereas in those without rectal stricture was 3.9 months, but the result probably more depended on the type of anorectal malformation and different operative procedures than hypothermia.

Our study confirmed that complications such as wound infection, wound dehiscence, wound retraction, colonic necrosis and recurrent fistula all affect post-operative strictures ($p = 0.029$, $p = 0.01$, $p = 0.01$, $p = 0.042$ and $p = 0.002$, respectively). The operations for low type anorectal malformations, which use local tissue flap such

TABLE 8. Comparison of rectal dilatation according to Protocol1 between those with and without post-operative stricture.

	Non-stricture	Stricture	P - value
Anal dilatation by parent	132 (81.5%)	28 (66.7%)	0.056
Duration of dilatation (months): median ± IQR	18.8 ± 24.8	34.4 ± 39.7	0.123
Frequency of rectal dilatation under GA: median ± IQR	1 ± 0	3 ± 3	< 0.001

as YV anoplasty and cutback anoplasty, have a very low incidence of complications. Anal transposition, which is mostly used for vestibular anus and requires mobilization of the rectum into a new position at the center of the sphincter of the anus[5], has a higher incidence of wound retractions (8.1%) and recurrence of fistula (2.7%). A colostomy prior to anal transposition has the benefit of reduced complications.[9] Moreover, colostomy prior to anal transpositions can reduce recurrent fistula and rectal strictures.[9] The incidence of recurrent fistula and rectal strictures when comparing between patients with a colostomy and those without a colostomy were 0% vs 9.1%, and 5.6% vs 18.2%, respectively.[9] Complications following PSARP included wound infection in 10.6% of cases, wound dehiscence in 2.4% of cases, retraction in 3.6% of cases, and a recurrent fistula in 1.2% of all cases. Abdominal assisted PSARP had more complications than PSARP, including wound infections in 5.6% of cases, wound dehiscence in 22.2% cases, and retractions in 5.6% of all cases. PSARVUP had the highest number of complications. More complicated operations were performed mostly for high type anorectal malformations. The more complicated the operation, the higher the complication rate, and the higher the complication rate, the higher post-operative rectal stricture.

2. Types of anorectal malformation. The different types of ARM have different stricture formation rates. In our series, the higher type anorectal malformation had the highest rectal stricture rate. In low type anorectal malformations, stricture formation following perineal fistula, vestibular fistula occurred in 4.1% and 14.7% of all cases, respectively. The types of anorectal malformations, which had statistically lower percentages of stricture were perineal fistula ($P = 0.003$) and imperforated anus without fistula ($p = 0.006$). In high type anorectal malformations, such as rectobladder neck fistula, the stricture rate was 70.6% ($p < 0.001$). Intermediate type anorectal malformations, such as rectobulbar urethral fistulas, had a stricture prevalence of 19.2%. Each type of anorectal malformation required a different surgical technique to repair, which was main reason why the stricture rates were so different. Even in the same technique, the difficulty to mobilize the rectum is a factor affecting rectal strictures. In a reported series[2], even with the same posterior sagittal anorectoplasty, the rate of rectal stricture was different. Rectal strictures were found to be more common in rectobulbar urethral fistula, rectobladder neck fistula, cloacal malformation.[2]

3. Type of operative treatment for anorectal malformation. Each operative technique has a different incidence of strictures. Posterior sagittal anorectoplasty (PSARP) is the most common procedure worldwide. This operation cuts the muscle complex in the sagittal line and divides both the anterior and posterior striated muscle complex to create a new anus and brings it into the center of the sphincter and sutures these muscle complexes (both anterior and posterior sphincter) back into the new normal position.[6,7] In our study, PSARP had a stricture rate of 15/81 (18.5%), which was higher than reported in a series by *Holbrook C*[4] which revealed a stricture rate of 6%. Posterior sagittal anorectoplasty was further developed into a new technique named "internal sphincter-saving posterior sagittal anorectoplasty".[4,11] This technique proposed the neo-anus be surgically inserted into the middle of the sphincter without cutting the muscle complex, and using a penetration in the middle of the sphincter instead, called the Internal Sphincter Sparing Approach (ISSA).[4,11] However this new technique had a 30% chance of severe rectal strictures. When laparoscopic pull-through in conjunction with the Internal Sphincter Sparing Approach (ISSA) was done, the stricture rate increased to 50%.[4]

The operative procedure for high or complex anorectal malformations such as abdominal assisted PSARP and PSAVUP had a high rate of rectal strictures with significant statistical difference ($P < 0.001$ and $P = 0.009$, respectively). This high rectal stricture could be the effect of high complication rates. The operation for low type anorectal malformation which use local tissue flap, such as YV anoplasty and cutback anoplasty, had a incidence of rectal strictures (0% and 1/20 (5%), respectively). Anoplasty in the reported series had stricture rate of 11%.[4]

4. Non-strict adherence to rectal dilatation protocols.[1,3,8] *Peña A*, a world authority, believes that rectal strictures are caused by non-dilatation of the anus when following his protocol.[1] Two weeks following surgical treatment of anorectal malformations, dilatation of the reconstructed anus with a Hegar dilator begins. The world authority, *Peña A*.[8] recommends dilation of the anus with a Hegar dilator. For the first dilatation, Hegar dilated the anus tightly. The dilation of the anus was done by parents twice a day. Then, the size of the Hegar dilator was increased by one number each week. The goal of rectal enlargement was relative to the patient's age. The goals for age 1-4 months, 4-12 months and 8-12 months were Hegar dilator number 12, 13, 14, respectively. The goals for ages 1-3 years, 3-12 years and >12 years were a Hegar dilator number of 15, 16, 17, respectively. When dilating the anus reached the goal, it could reduce the frequency of rectal dilatation. This could be reduced to once a day for a month, then every three days for another month,

then twice a week for a month, once a week for another month, and finally once a month. When the patient gets older, the size of the Hegar dilator must increase.

However, some reported series state that dilatation of the rectum by parents was not necessary on an everyday basis, but that it could be calibrated every week by a doctor[12] and the results were not so different. The limitation of this reported study was the small number of patients, as only 65 patients received routine dilatation by parents compared to 30 patients who underwent weekly calibration by surgeons.[12]

A survey of parental behavior in rectal dilatation was conducted in the Federal Republic of Germany.[2] Only 30% of patients strictly followed twice-daily rectal dilatations. In addition, half of the patients got rectal dilatation with a Hegar dilator smaller than the recommended size.[2] In Germany, only about 25% of patients achieved the full recommendation of dilatation of the rectum as per the protocol.[2] In Thailand, there has never been a survey of parental behavior of anal dilatation before.

In our series, 129 patients underwent colostomy. Those with a colostomy had more rectal stricture formation than those who had no colostomy before (82.5% vs 17.5%), with a statistically significant difference ($p = 0.008$). However, colostomy was selected to be performed as an initial operation for non-low type anorectal malformations only. Vestibular fistula was the unique type of anorectal malformation, whether it is regarded as a low or non-low type anorectal malformation. A previous study at Siriraj Hospital reported that colostomy prior to anal transposition could reduce the recurrent fistula and rectal stricture.[9] Besides the vestibular fistula, it could not conclude whether pre-operative colostomy prevented rectal stricture formation due to different populations.

After surgical correction for anorectal malformation, postoperative dilatation was performed to prevent rectal strictures. Routine rectal dilatations by parents was done in 160 patients and rectal stricture was found in 28/160 (17.5%) cases. Routine rectal dilatation by parents seemed to prevent rectal strictures ($p = 0.056$).

The initial remedy for post-operative stricture was treatment by dilating the rectum under general anesthesia. However, it has been argued that general anesthesia followed by forceful dilatation may result in more severe scarring from dilatation.[1] Prolonged rectal dilatation treatment even with general anesthesia may not be the most effective treatment for rectal stricture and 50%-87% of cases still require surgical correction for rectal stricture.[2,4] When treatment by dilating the anus under general anesthesia does not improve the symptoms, the subsequent treatment was surgical treatment. Redo-anoplasty, redo-PSARP, redo pull-through have also been described.[3,4] The surgical treatments for rectal stricture in our series composed of 23 (57.5%) cases of anoplasty, 7 (17.5%) cases of PSARP, 6 (15%) cases of abdominal assisted pull-through and 4 (10%) cases of abdominal assisted PSARP. Some strictures might occur at superficial level which may be corrected with anoplasty. There are several anoplasty techniques to correct anal stenosis, including YV anoplasty[13], Nixon anoplasty, and Heineke-Mikulicz anoplasty.[1] Our study did not have the number of patients required with rectal stricture to determine which surgical techniques would provide the best results. Twenty-six percent of patients who had anoplasty correcting the rectal stricture, still experienced rectal stricture, and another anoplasty was required, while many other patients required megarectum resection.

Our study did have some limitations.

First, the definition of rectal stricture following surgical treatment for anorectal malformation in our study might be different from other studies. In our series, rectal stricture included only patients who had undergone any surgical corrections as a result of rectal stricture following surgical treatment for anorectal malformation.

Second, it had a retrospective design which meant some information may be missing.

Third, the types of operation depended on each surgeon's preference.

Fourth, the generalizability of the results is restricted. The study was conducted in one university hospital, and thus, there may be complications following operation that are not evident elsewhere.

CONCLUSION

The higher types of ARM have higher rectal stricture rates. Complications such as wound infection, dehiscence, retraction, colonic necrosis and recurrent fistula all affected the post-operative stricture ($p = 0.029$, $p = 0.01$, $p = 0.01$, $p = 0.042$ and $p = 0.002$ respectively). More complicated operations were mostly performed for higher type ARM. The higher the complication rate, the higher the post-operative rectal stricture rate. Routine rectal dilatation following *Peña A's* protocol by parents seemed to prevent rectal strictures ($p = 0.056$). Post-operative rectal stricture occurred because of complications following complicated operations for high type ARM. Meticulous operative technique was crucial.

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Patients' Need for Sexual Counseling in the Cardiac Rehabilitation Service

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ABSTRACT

Objective: To evaluate the need for sexual counseling among patients with heart disease

Materials and Methods: Data were collected from 363 patients with heart disease attending a cardiac rehabilitation outpatient clinic. Participants completed the questionnaire independently.

Results: The participants consisted of 241 males (66.4%) and 122 females (33.6%) with a mean age of 57.69±14.50 years. Among them, 248 (68.3%) were married. Most participants (91.2%) agreed that healthcare providers should offer sexual counseling to all heart patients of reproductive age, and they wanted their healthcare providers to initiate the counseling. Factors related to the need for counseling were being male (OR=2.07; 95% CI =1.05-4.07), being married (OR=2.04; 95% CI =1.03-4.05) and being 50 years of age or younger (OR 9.05; 95%CI =2.06-39.82). The main obstacles affecting conversations about sexual activity with healthcare providers were feeling embarrassed (45.7%), being physically impaired (45.4%), and having a third person present during counseling (44.9%).

Conclusion: Most patients with heart disease want to receive counseling on how to safely resume sexual activity following their illness. They expect healthcare providers to initiate such counseling during visits to cardiac rehabilitation clinics. It is crucial that healthcare providers provide counseling in a format that is tailored to the needs and preferences of each patient.

Keywords: Heart disease; cardiac rehabilitation; sexual activity; sexual counseling (Siriraj Med J 2023; 75: 522-528)

INTRODUCTION

Heart disease is the leading cause of morbidity and mortality worldwide. One of the most common problems among patients with heart disease is sexual problems, which are found to be more prevalent in such patients than in the general population within the same age range. These issues can adversely impact the patients' quality of life in terms of physical, mental, and marital well-being.[1] Multiple studies have found that 20-70% of male[2-5] and 43-87% of female[3,6] patients with heart disease have sexual problems. There are several factors that cause sexual problems. Physical factors such as dyspnea, fatigue, exercise intolerance, and decreased libido are caused by cardiac problems and side effects of certain medications. Psychological factors, such as fear and anxiety that engaging in sexual activity may trigger life-threatening cardiac symptoms, can also lead to depression. Other factors, such as concerns from partners that sexual activity may result in an acute relapse and death, can also play a role.[1] Both the American Heart Association (AHA) and European Society of Cardiology (ESC) clinical practice guidelines recommend that patients and their partners be offered sexual counseling to safely resume sexual activity, maintain marital harmony, and improve the patients' quality of life.[7,8] Healthcare providers should provide sexual counseling to heart patients who do not have contraindications.[8]

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Proper sexual counseling is imperative for heart patients, but a previous study found that the rate of patients with cardiovascular disease who had never received appropriate sexual counseling was as high as 66%, while 37% did not want to receive counseling on such matters.[9] Reasons for not wanting to receive counseling include not feeling ready to talk about sex, feeling embarrassed to ask questions, and concerns that counseling sites are not private.[9] In Thailand, sociocultural norms differ from those of western countries, making conversations regarding sex taboo. This is consistent with the results of a study which found that 80% of post-heart-surgery patients had never received counseling about sexual activity, and 62% did not want sexual counseling. However, the study did not address why patients did not seek counseling.[10]

A literature review of research in Thailand revealed a lack of research on the opinions of heart patients regarding sexual counseling following the onset of their illness. This included a lack of studies on appropriate sexual counseling formats tailored to the specific needs of these patients. Therefore, we were interested in conducting research on this issue in order to apply the results of the study to Thai patients appropriately.

Objective

To assess the need for sexual counseling among patients with heart disease, identify factors that contribute to the need for counseling, and explore factors that impede counseling.

MATERIALS AND METHODS

The study was conducted under the approval of the institutional review board (COA no. Si 636/2019) and registered in the Thai Clinical Trials Registry (TCTR20230130007). The research design employed was a cross-sectional descriptive study. Data were collected from September 2019 to September 2020 through questionnaires administered to heart patients aged 18 years and over who had been attending the outpatient cardiac rehabilitation clinic for a minimum of 3 months. Participants were required to have a diagnosis of heart disease, such as coronary artery disease, valvular heart disease, or congestive heart failure. Patients had to be able to read and write Thai language and must not have been diagnosed with dementia. Participants who did not complete the demographic data or completed less than 50% of the sex questionnaire were considered to have provided incomplete information and their data was not included in the analysis.

Sample size calculations were based on data from the Ramathibodi Hospital study[10], which found that the prevalence of postoperative heart disease patients seeking sexual counseling was 38%. This study provided the basis for determining that a sample size of 363 participants would be required to achieve an error in estimation of no more than 5% at a 95% confidence level (type I error = 0.05, two-sided).

Research procedure

We designed a questionnaire that met the objectives of the study by referencing relevant studies conducted in Thailand and abroad. The questionnaire consisted of questions for determining demographic data and questions about the need for sexual counseling. To ensure the questionnaire's face validity, it was pre-tested on a sample of 10 volunteers who were not healthcare providers. Their feedback was utilized to make adjustments to the questionnaire in order to align it with the research aims and the target population. Eligible patients with heart disease who had been attending the outpatient clinic were invited to participate in the study, in accordance with the established inclusion and exclusion criteria. Each participant was required to sign a consent form prior to participating in the study. Participants completed the questionnaire independently and were given the option to not answer any questions they did not wish to answer. To maintain participants' confidentiality, completed questionnaires were kept in sealed envelopes and stored separately from the consent forms which participants had completed to participate in the research. All data collected was later analyzed statistically.

Statistical analysis

Descriptive statistics were employed to summarize demographic data. The prevalence was analyzed using percentages and 95% confidence intervals. Univariate analysis was conducted to examine the correlation between clinical data and the need for sexual counseling, utilizing the chi-square test for categorical data and the unpaired t-test for continuous data that were normally distributed. For continuous data that were not normally distributed, the non-parametric Mann-Whitney U test was used. Multivariate analysis was performed using multiple logistic regression to identify multifactorial correlations, and the degree of correlation was reported as odds ratios with 95% confidence intervals.

RESULTS

A total of 363 heart patients participated in this study, with 100% returning and completing all items of the questionnaire. There were 241 males (66.4%) and 122

females (33.6%), with a mean age of 57.69±14.50 years. The numbers of participants with a diagnosis of coronary artery disease, valvular heart disease, and congenital heart disease were 193 (53.2%), 147 (42.1%), and 45 (12.4%), respectively. Of the 363 participants, 53.7% were able to perform at New York Heart Association Classification level 1, and 248 people were married (68.3%) (Table 1).

Prior to participating in the study, 132 participants

TABLE 1. Demographic and clinical characteristics of the patients (n=363).

Characteristic	Value
Age (years), mean±SD (min,max)	57.69±14.50 (18.00, 88.00)
Sex: male, n (%)	241 (66.4%)
Body mass index (kg/m^2), mean± SD (min,max)	24.472±3.930 (15.24, 41.87)
Religion: Buddhism, n (%)	358 (98.6%)
Marital status, n (%)	
Single	65 (17.9%)
Married	248 (68.3%)
Widowed/Divorced/Separated	50 (13.8%)
Education, n (%)	
Below bachelor's degree level	206 (56.8%)
Bachelor's degree level	106 (29.2%)
Higher than bachelor's degree level	51 (14.0%)
NYHA classification, n (%)	
I	195 (53.7%)
II	162 (44.6%)
III	6 (1.7%)
Cardiac diagnoses#, n (%)	
Coronary artery disease	193 (53.2%)
Valvular heart disease	147 (42.1%)
Congenital heart disease	45 (12.4%)
Aortic disease	16 (4.4%)
Heart failure	4 (1.1%)
Cardiac arrhythmia	29 (8.0%)
Comorbidities#, n (%)	
Diabetes mellitus	88 (24.2%)
Hypertension	159 (43.8%)
Dyslipidemia	113 (31.1%)
Stroke	11 (3.0%)
Arthritis	35 (9.6%)
Peripheral artery disease	5 (1.4%)

#Multiple answers were possible.

(36.4%) had previously received sexual advice from a healthcare provider. Counseling provided by cardiac surgeons, physiatrists, and nurses accounted for 49 people (24.5%), 41 people (20.5%), and 35 people (17.5%), respectively. Most of the patients (97 people, 73.48%) reported being very satisfied with the counseling. In addition to receiving counseling from a healthcare provider, 20.1% of the participants also obtained information about sex through other means, such as studying on the internet or reading hospital pamphlets. Among all participants, 222 (61.2%) participants had no concerns regarding sexual activity.

As for the need for sexual counseling, a high number of participants (66.1%) wanted to receive counseling. The variables that significantly associated with the need for sexual counseling from univariate analysis were entered into multivariate regression analysis. The results of multivariate analysis revealed being 50 years of age or younger (OR 9.05; (95%CI =2.06-39.82), being male (OR = 2.07; 95% CI = 1.05–4.07), and being married (OR=2.04; 95% CI=1.03–4.05) to be independently correlated with the need for sexual counseling, as shown in Table 2.

A majority of the participants (91.2%) agreed that healthcare providers should provide sexual counseling to all patients of reproductive age with cardiac disease. Those who disagreed cited reasons such as old age, being widowed, physical impairments, and not wanting to engage in sexual activity. About half of the participants had a positive attitude towards sexual counseling by healthcare providers, with less than 1% feeling uncomfortable, annoyed, or angry about it. Nearly 80% of the participants wanted sexual counseling to be initiated by healthcare providers. The preferred format of counseling was a doctor/ healthcare provider providing sexual counseling along with other advice, without needing to be requested by patients, followed by using media for preliminary counseling, which allowed patients to study at home and have additional channels they could use to ask for more information later. The types of media that patients wish to use to seek additional information in addition to talking directly to healthcare providers include brochures, medical websites, and social media. Having the opportunity to ask a healthcare provider about sexual problems was deemed necessary to help patients in this regard by 72.2% of the participants. The three main obstacles affecting conversations about sex with healthcare providers were feeling embarrassed, being physically impaired, and having a third person in the exam room (Table 3). The majority of male participants agreed that sexual counselors could be of any gender, while about half of female participants preferred counselors of the same gender (Table 4).

TABLE 2. Univariate and multivariate analysis for factors significantly associated with requirement of sexual counseling.

Factors	Wanted n=240	Not wanted n=54	Univariate analysis* Crude odds ratio (95%CI)	*P*-value	Multivariate analysis** Adjusted odds ratio (95%CI)	*P*-value
Gender, n (%):						
Male	170 (85.0%)	30 (15.0%)	1.94 (1.06,3.56)	**0.031**	2.07 (1.05,4.07)	**0.035**
Female	70 (74.5%)	24 (25.5%)	1.00		1.00	
Marital status, n (%):						
Married	167 (69.6%)	31 (57.4%)	1.697 (0.93,3.11)	**0.085**	2.04 (1.03,4.05)	**0.041**
Others	73 (30.4%)	23 (42.6%)	1.00		1.00	
Age (years), n (%):						
≤ 40	30 (12.5%)	1 (1.9%)	11.08 (1.46,83.89)	**0.020**	16.90 (2.15,132.85)	**0.007**
41-50	46 (19.2%)	2 (3.7%)	8.49 (1.97,36.59)	**0.004**	9.05 (2.06,39.82)	**0.004**
51-60	53 (22.1%)	10 (18.5%)	1.96 (0.91,4.21)	**0.085**	1.96 (0.89,4.32)	0.094
> 60	111 (46.3%)	41 (75.9%)	1.00		1.00	
Arthritis, n (%):						
No	222 (92.5%)	43 (79.6%)	3.15 (1.39,7.15)	**0.006**	2.23 (0.92,5.41)	0.075
Yes	18 (7.5%)	11 (20.4%)	1.00		1.00	

Abbreviations: CI, confidence interval; SD, standard deviation
*p-value < 0.1 indicates statistical significance in univariate analysis
**p-value < 0.05 indicates statistical significance in multivariate analysis

TABLE 3. Patients' opinions about sexual counseling.

Patients' opinion	n (%)
Sexual counseling requirement	
Wanted	240 (66.1%)
Not wanted	54 (14.9%)
Not sure	69 (19.0%)
Feeling when receiving sexual counseling[#]	
Glad	172 (47.4%)
It is necessary	172 (47.4%)
Normal	154 (42.4%)
Relieved	29 (8.0%)
Indifferent	95 (26.2%)
It cannot help	11 (3.0%)
Uncomfortable	3 (0.8%)
Annoyed	3 (0.8%)
Angry	1 (0.3%)
Media used to get information about sexual problems[#]	
Brochures	152 (41.9%)
CDs or DVDs	24 (6.6%)
Medical websites	92 (25.3%)
Social media	52 (14.3%)
Applications	9 (2.5%)
Obstacles to sexual counselling[#]	
Embarrassment	166 (45.7%)
Unstable health status	165 (45.4%)
Presence of third party	163 (44.9%)
No privacy	151 (41.6%)
Not enough time	151 (41.6%)
Old age	147 (40.5%)
Not enough experience	145 (40%)

[#] Multiple answers were possible.

TABLE 4. Preferred gender of health professional for sexual counseling.

Patients' gender	Preferred gender of health professional for sexual counseling, n (%)		
	Male	Female	Any
Male	38 (15.8%)	9 (3.7%)	194 (80.5%)
Female	2 (1.6%)	58 (47.5%)	62 (50.8%)

DISCUSSION

The results of this study indicate that about 36% of the participants had received sexual counseling from a healthcare provider. This trend shows an increase in the rate of sexual counseling compared to a previous study conducted in Thailand between 1996-1998, which examined the need for sexual counseling in patients who underwent coronary artery bypass surgery and/or heart valve replacement surgery. The mean age of respondents in that study was comparable to that of our study, but only 20% of patients in that study had previously received counseling. In terms of patients' need for sexual counseling, this study was higher than the prior study which found that only 38% of participants wanted to receive counseling.[10] This may be due to increased openness and awareness among healthcare providers regarding the importance of sexual counseling. We found that the rate of receiving sexual counseling and patients' need for sexual counseling were similar to the study conducted in a western country.[9] Nevertheless, the rate of sexual counseling in our study was not met the expected rate endorsed in the international guidelines.[7,8]

When studying the factors related to the need for sexual counseling, we found that the need for sexual counseling in males was two times that in females, which was consistent with a previous study that stated although most males had more sexual dysfunction than females, after the onset of cardiovascular disease, most males were still more interested in sexual activities than females. In addition, this study found that female participants were more likely to prefer a sex counselor of the same gender, while most men reported no preference. This suggests that women may have more reservations about discussing sexual issues with healthcare providers of the opposite gender. According to World Health Organization categorization, people under age 50 is a reproductive age group.[11] In our findings, we found that people of an age younger than or equal to 50 years old had a need for counseling about 9 to 16 times higher than those over 60 years old. This may be due to a decrease in sexual desire caused by a decline in sex hormones in advancing age as well as physical and mental limitations, which affect sexual activity. Regarding the marital status factor, we found that participants with partners were twice as likely to need sexual counseling as those who were single. We hypothesize that patients' having knowledge and understanding about sexual activity following the onset of their illness can help them and their partners feel more confident and improve the quality of their relationship and overall life. In terms of the format of sexual counseling, the majority of patients reported that direct consultation with healthcare providers was the most preferred method, which was consistent with a study by Baert et al. that found that over 50% of patients preferred to discuss sexual problems with a healthcare provider.[12]

In this study, we found that the main barriers affecting conversations about sex with healthcare providers were feeling embarrassed, the presence of a third person in the exam room, a lack of privacy at the counseling location, physical limitations, and being of advanced age. This is in line with previous studies.[12,13] Additionally, we found that a lack of knowledge about sexual counseling among healthcare providers was also a barrier, which we believe can have a significant impact on the provision of sexual counseling. These findings indicate that, in addition to addressing issues of location privacy and taking account of patients' age and physical abilities, healthcare providers must also be adequately informed to effectively reassure patients that it is safe to resume sexual activity following the onset of cardiovascular illness.

This study's limitations included the fact that religious factors were not taken into consideration as a possible limitation to receiving sexual counseling, as 99.2% of the participants in this study were Buddhists. Additionally, data on the quality of life or mental health of patients with cardiovascular disease after counseling were not collected. Therefore, future studies on these issues should be conducted.

CONCLUSION

Most patients with heart disease, but especially younger males who are married, are concerned about and need to receive counseling on how to safely resume sexual activity. Healthcare providers should recognize the importance of the issue and increase their skills in providing counseling on such matters. Additionally, the result indicate that the most common barrier of counseling is feeling embarrassed. Therefore, the healthcare providers should be proactive in initiating conversations about returning to sexual activity along with giving other advice and consider tailoring counseling formats to match the needs and preferences of each patient, in order to improve their quality of life.

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Social Support in Quality of Life among Breast Cancer Patients after Diagnosis: A Bibliometric Analysis

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ABSTRACT

In terms of bibliometric analysis, there are no studies related to the impact of social support on breast cancer survivors' quality of life. Therefore, this study aims to provide a bibliometric assessment of results on social support in quality of life in breast cancer patients. The studies for the dataset were selected from Scopus published in the year 2001–2021 based on their relevancy to the established subjects. The VOSviewer software was used for bibliometric analysis to represent the performance of publications covering annual outputs, mainstream journals leading countries, institutions, research tendencies, and hotspots. The analysis of the findings indicated only 45 articles over the range of 2001-2021. We highlighted that the highest number of publications was published in 2021, and the lowest was in 2002-2004 and 2006. Social support strongly correlates with the psychological adjustment of adherence to cancer treatment. Only one study failed to find an association between social support and suicide after a cancer diagnosis. Meanwhile, China, the USA, and Hong Kong contributed to social support. Instrumental, financial, information, and emotional support were reported as domains needed to support breast cancer patients. This bibliometric analysis provides the results of thoughts and insights about the development needed by breast cancer patients to prolong survival.

Keywords: Breast cancer; bibliometric analysis; social support; quality of life; journal; Scopus (Siriraj Med J 2023; 75: 529-537)

INTRODUCTION

Cancer is the leading cause of mortality before the age of 70 in 112 nations worldwide. Breast cancer was diagnosed in 2,261,419 or 11.7% of total type of cancer in 2020 and resulted in 684,996 or 6.9% deaths.[1] Due to the frequency of the disease and its favorable prognosis, it is anticipated that 4.4 million women will live with breast cancer for at least five years after being diagnosed.[2] Moreover, the top five countries with the highest incidence were Asia, ranking first at 49.3%, followed by Europe with an incidence of 22.8%. In 2020, it was also reported to cause 684,996 or 58.3% cancer-related deaths worldwide.[1]

Many factors influence the incidence and mortality of cancer, including aging and population growth, as well as changes in the importance and distribution of the principal risk factors.[3] The previous study revealed that the high incidence had been associated with factors related to diet and population aging, including healthy-life changes such as physical inactivity, obesity, tobacco use, and alcohol consumption.[4,5] Several approaches have been used to improve cancer patients' overall survival, including surgery, radiotherapy, and chemotherapy.[6] However, these methods cannot totally tackle the cancer problem, which is not yet fully considerable.

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Patients with breast cancer should undergo therapy and treatment for recovery, such as radiotherapy as the primary curative treatment, in combination with chemotherapy, hormone therapy, immunotherapy, and surgery.[7-11] The therapy and treatment have been shown to significantly prolong their survival.[12,13] Apart from the beneficial effects, various physical, psychological, and social problems can affect the patient's quality of life.[14] Evidence supports the unfavorable impact of breast cancer treatment, such as patients having radiation frequently reporting sleep disorders such as insomnia and excessive drowsiness.[15-17] Other physical effects encountered by breast cancer patients, such as pain, exhaustion, and lymphedema, were seen in the prior study.[18] It also indicated that discomfort in the anterior thorax, axilla, and upper arms generates persistent pain for more than three months.[19] Meanwhile, helplessness, anxiety, embarrassment, self-esteem, stress, fear of being abandoned by a spouse, sexual dysfunction, and dread of confronting the future and mortality are all common psychological and social effects of the therapy.[20]

The burden of physical and psychological symptoms during the treatment contributes to poor quality of life (QoL).[21] A study in Norway explains that optimism is one of the keys to improving the quality of life of breast cancer patients.[23] According to a Chinese study, social support has a role in reducing psychological stress in cancer patients.[24] Furthermore, breast cancer also poses psychological challenges for sufferers related to female body image, sexuality, and motherhood.[25] According to Eom *et al.* (2013), there is a decrease in quality of life in survivorship associated with a decrease in emotional support.[26] Furthermore, a previous study in India showed that 93.6% of the 768 patients suffering from various cancers were depressed and anxious due to facing many financial difficulties.[27] It can be a key factor in social support as one strategy to improve quality of life after diagnosis. A study in China explains that social support plays a role in minimizing psychological stress. Knowing a patient's quality of life (QOL) might help clinicians identify people at high risk of recurrence or death but many studies have shown inconsistent results.[28-30,21,31,32] Therefore, this study tries to map the trends of several studies related to the role of social support in the quality of life of breast cancer patients.

Bibliometrics were used to determine trends in social support research and quality of life for breast cancer patients. The analysis is a widely used tool to assess the academic status of a specific field.

MATERIALS AND METHODS

Bibliometric methods were conducted in this study. In research, bibliometric methodology has been widely used to analyze scientific publications such as research articles, books, conference papers, and journals.[33,34] This method has powerful capabilities used for a variety of purposes, including spotting emerging trends in article and publication performance, collaboration patterns, and research features, as well as examining the intellectual structure of a particular field in the current literature.[35]

Furthermore, it obtains high-impact research articles quickly, finds research directions that concern their peers, identifies previous research performance with developing trends in publications related to institutions, countries, people, funders, and disciplines related.[36] In this study, the core collection of Scopus databases was used as a source for articles published between 2003 and 2021.

This study searches the document from the Scopus database with keywords "quality of life" AND "breast cancer" OR "mammary" OR "breast carcinoma" AND "social support". Inclusion criteria for further analysis were based on: 1) articles describing the relationship between social support and quality of life of breast cancer patients; 2) original articles; and 3) all publications in English. However, those related to animal experiments, editorial materials, letters, or guidelines are excluded.

The data were downloaded from the Scopus database from September to December 2021. Furthermore, this database was selected because it is more significant than PubMed or Web of Science with the most extensive catalogs. The search engine of SciVerse Scopus provides a wide range of views that allows for the retrieval of related documents in the most efficient way possible. This study found 45 documents, with most of the types being articles.

Statistical analysis

To map the construction of a keywords network and its clustering, raw data in Bibtex, RIS, and CVS files were extracted and examined with VOSviewer version 1.6.0 software. The research analyzed and represented the number of publications each year, citation analysis, co-authorship, common citation network, and topic trends.[37] The bibliometric software is used to construct data visualization of co-authorship maps of authors, countries, citation analysis, and co-occurrence keywords.

RESULTS

Annual number of publications.

Fig 1 shows an architectural diagram of the data collection process, which presents the selection of specific articles. A total of 45 articles on health-related quality of life in breast cancer were published from 2001 to 2021 (Fig 1). Fig 2 presents the trend of publication number from 2001 to 2021. It can be seen that most publications were in 2021 and the lowest ones were in 2002-2004 and 2006. Social support strongly correlates with the psychological adjustment of adherence to cancer treatment (PMID: 23098436). Additionally, most of the documents on social support and cancer treatment were published in 2013. The first systematic review was published in 2013 with 14 original studies (PMID: 23097417 and this is normal since the previous year's publications were limited. The systematic review mentioned that social support was crucial in promoting cancer patients' emotional, functional, and physical functions (PMID: 23097417).

Subsequently, Fig 3 shows the manuscript that minimally had 1 publication from 2001 to 2021, and the documents were published in 2017-2018.

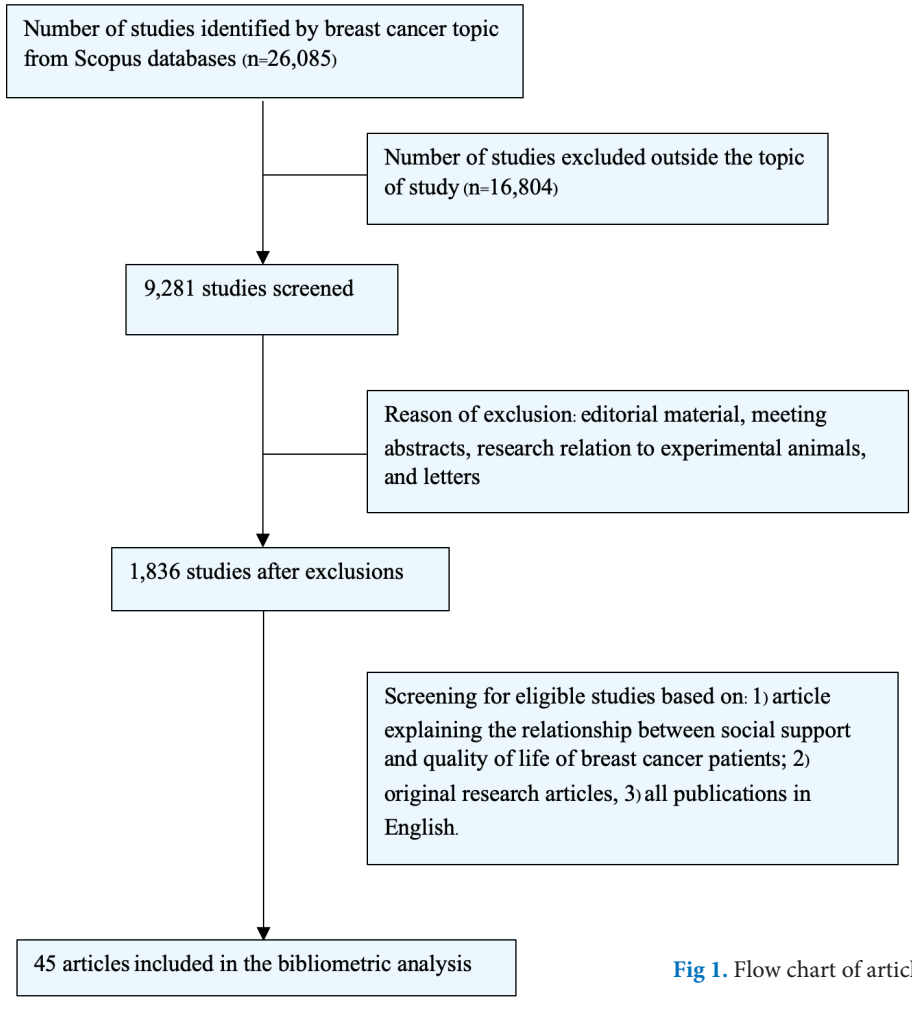

Fig 1. Flow chart of article selection.

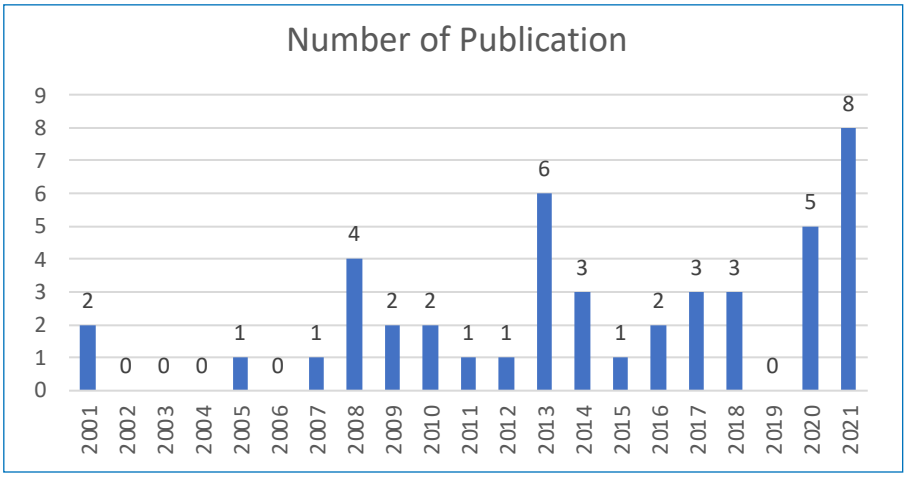

Fig 2. Annual number of publications related social support in quality of life among breast cancer patients after diagnosis from 2001-2021.

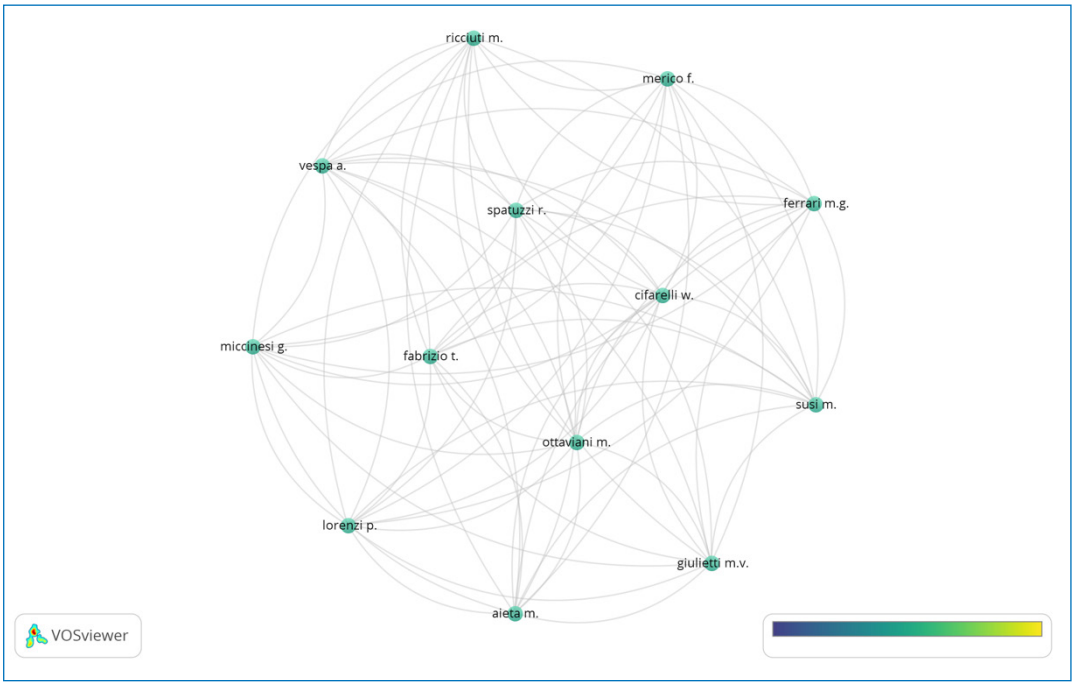

Fig 3. The manuscript's authors, which had 1 publication minimally from 2001 to 2021.

Yellow: current years. Dark colour: last years

This analysis identified the top ten distributions by year, screened them with one publication, and were published between 2012 and 2013. The newest meta-analysis and systematic review presented no correlation between social support and suicidal ideation in cancer patients (PMID: 33277772). However, social support was suggested as part of health care promoting patients' quality of life.

Fig 4 presents the top 10 countries with many publications. The United States has the most publications with 18 articles, compared to China and Hong King with 5 and 3, respectively. In the USA cancer is the most common cause of death, and in 2013, around 1.5 million new cases were expected to be diagnosed, and around 1,600 patients were projected to die.

Cancer is a major worldwide health concern and cause of mortality in China, accounting for 19,292,789 cases and 9,958,133 deaths. Lung, liver, stomach, esophageal, and colorectal cancers are the leading five causes of mortality. About 45.2% of cancer deaths in China are occurred in adults aged 20 years or older.

Fig 5 shows that China had the newest publications in 2018; meanwhile, the documents from The United States were published in 2012.

Fig 6 depicts the affiliations, and the majority of which were obtained from the university. The university has a good funding and facilities capacity for supporting the conduction of studies. Furthermore, some countries, like Indonesia have mandatory work for doing the research and publication to reach a higher degree.

Most of the studies presented the quality of life

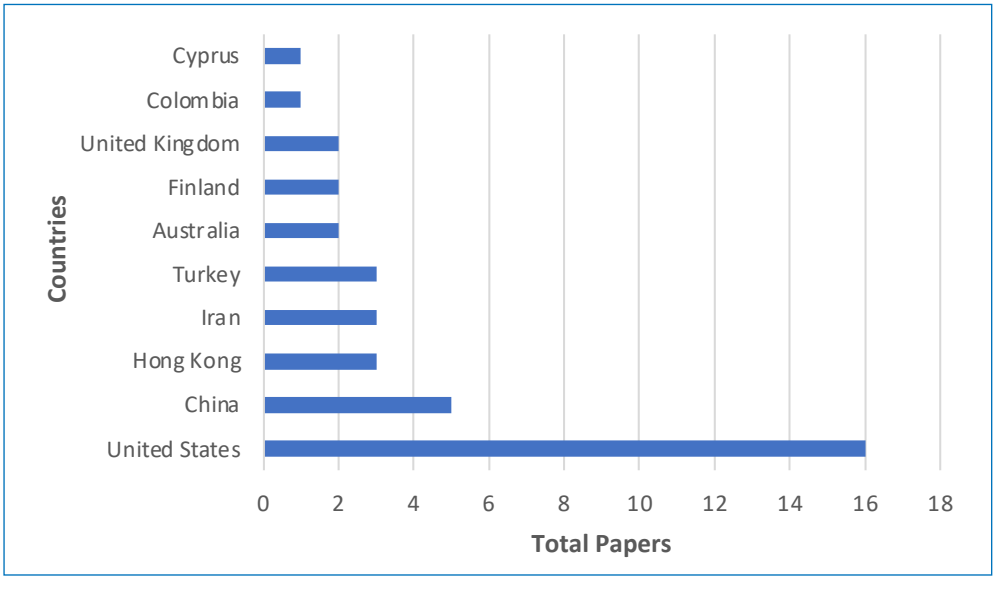

Fig 4. The publications distribution based on country-specific social assistance in quality of life among breast cancer patients following diagnosis.

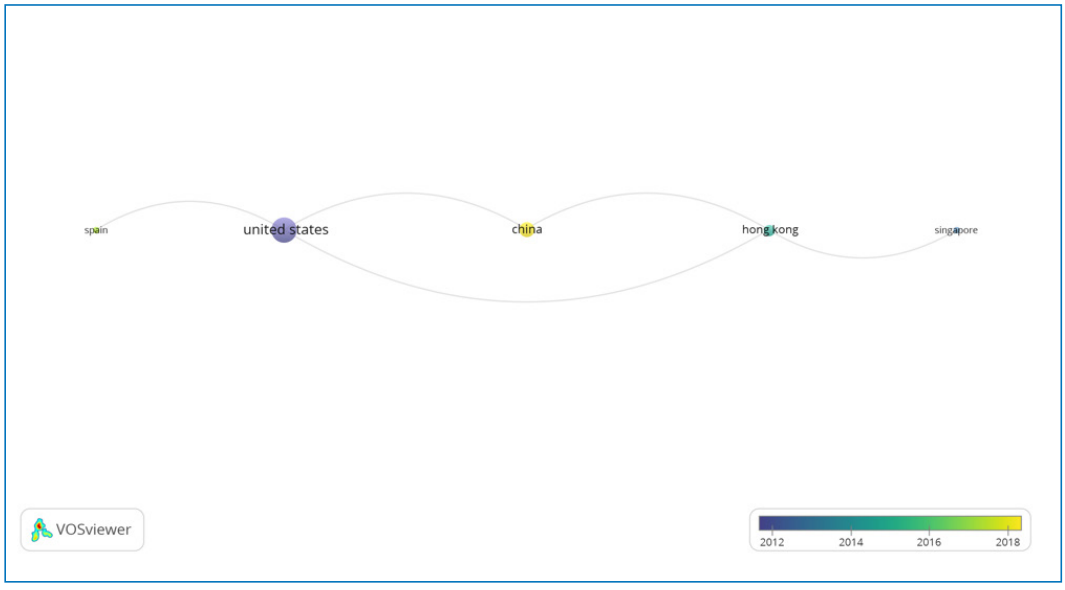

Fig 5. The distribution of the documents based on the countries and year.

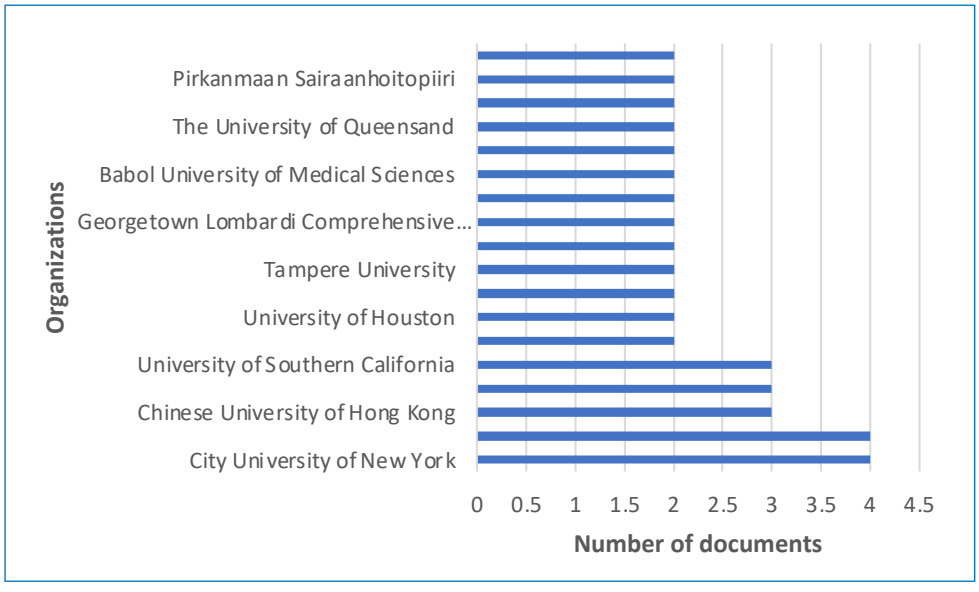

Fig 6. The distribution of the publications based on the authors' affiliation.

around 2013-2014 as indicated in Fig 7. However, the current keywords are psychological, cross-sectional studies, survey and questionnaire, anxiety, and cancer survivors. The current study topics are related to a cross-sectional design, using a questionnaire with a survey method, and some of the topics are related to anxiety and other psychological condition. No countries' names are mentioned in the keyword description, hence there are some possibilities to conduct this study in Indonesia.

Fig 8 presents the types of publications and the number of documents. The Erratum type only has a small proportion of 4.4%. Original articles, reviews, systematic reviews, and meta-analyses were grouped by Scopus.

Fig 9 illustrates the journal which published the documents in the Psychology Oncology and Journal of Oncology Nursing. Until 2021, the number decreased in the European Journal of Oncology Nursing and International Health.

DISCUSSION

Breast cancer remains a major contributing factor to a global burden, as millions of women are battling by seeking treatment and medication for their survival. Women are more likely than any other gender to be diagnosed with this cancer, and it is also the top cause of cancer-related deaths throughout the world.[1] A person diagnosed faces the reality of information that is not readily accepted by the patient and becomes a source of stress including those related to physical rejection, financial difficulties in carrying out care, treatment, and emotional reactions. The previous study has explained that infected people will physically experience significant changes at the time of initial diagnosis and during treatment experience fatigue, nausea, vomiting, pancytopenia, alopecia, weight loss, changes in appetite, and diarrhoea.[38,39] Furthermore, chemotherapy causes hair loss, black skin and nails, and weight loss.[40] Psychological pressures such as the

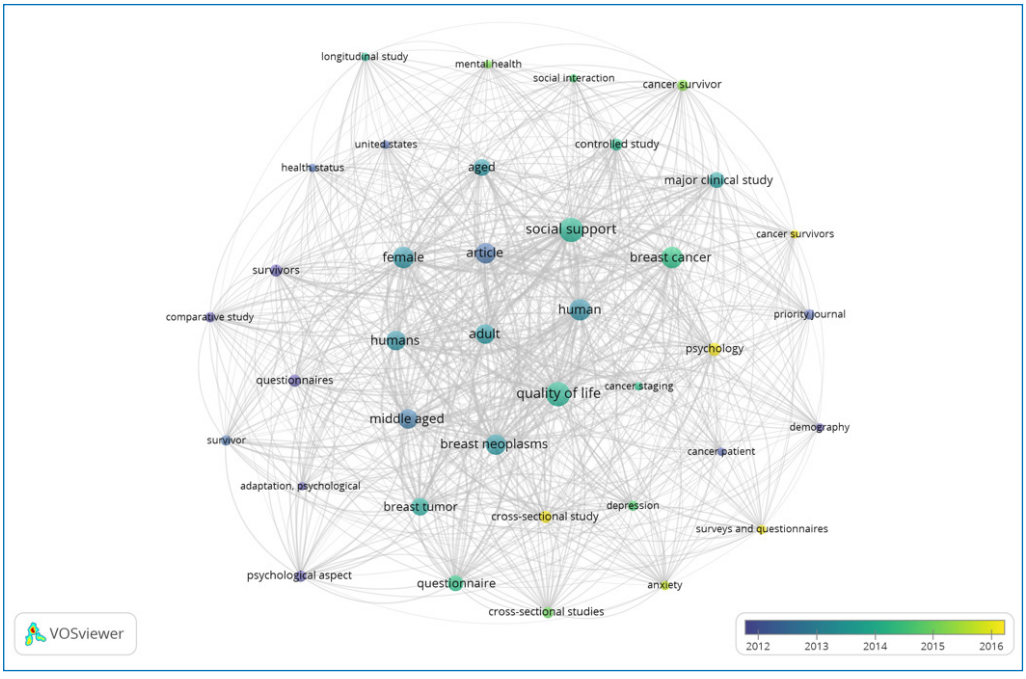

Fig 7. The most common keywords related to the social support for cancer patients

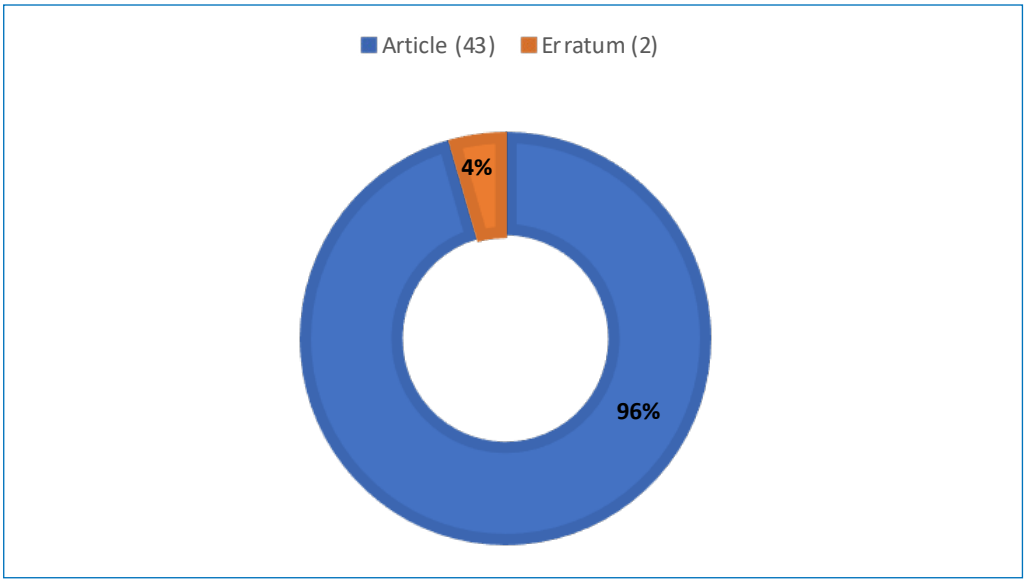

Fig 8. The distributions of the documents based on the article types.

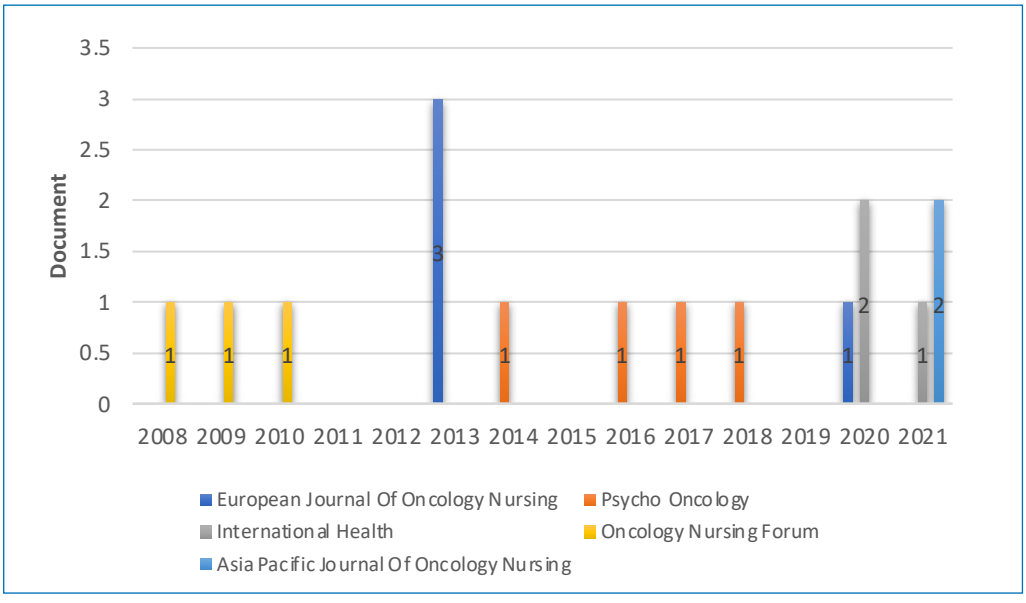

Fig 9. The document distributions are based on the name of the journal.

emergence of negative feelings such as shock, anxiety, anger, protest, and depression are also experienced by patients, considering the long duration of treatment, having high pain effects, and worrying about expensive treatment costs.[41-43]

In this study, the overall aim is to consolidate the research area of health-related quality of life in breast cancer. The current study clearly found that the trend was an increase in publications during the last decade of the study period. The literature of social support had a strong correlation with the psychological adjustment of adherence in cancer treatment.[44] Interestingly, most of documents about the social support and cancer treatment, previously was published in 2013. The first systematic review was published in 2013 with 14 original studies.[45] Since the number of publications in the previous year was limited, this is normal. The systematic review mentioned that the social support of cancer patients was very important for promoting their emotional, functional, and physical health.[45] China and the USA are the leaders as well as ranked first and second respectively in the number of publications in this field. It is surprising that the incidence rates of breast cancer are rising fast in those two countries. It is important to noted that these countries are leading the world in research, including medicine. The current study showed also that the type of document were article types compare to other type of document. This study emphasized that the scientist around the world focused on doing research related to the health-related quality of life in breast cancer.

A cancer diagnosis can cause physical and emotional stress such as anxiety, fear of undergoing further treatment due to high costs, depression, and even death. This psychological stress is more experienced by older patients. This is because they have more pre-existing chronic diseases, such as impaired physical performance and cognitive function, which are clinically predicted to cause death and toxicity during chemotherapy.[46-51] Meanwhile, adequate social support is necessary for patients to navigate sudden life changes and emotional responses associated with cancer. In a study conducted by Usta (2012), the current the current knowledge of social support strongly associated with cancer progression.[44] It is a positive interactive process that is classified into various types among breast cancer survivorship in the form of instrumental support by giving physical/medical assistance, financial, information support by advising and educating; and emotional support by empathizing. Subsequently, it can be a coping strategy in dealing with the breast cancer experiencing.[25] Luszczynska et al systematically identified primary care providers, family members, and friends as the key persons in reducing their distress of cancer patients who have significantly supported their survival.[45] Depression and severe anxiety might result from a lack of social support from family members and those who are close to the patients.[52] In earlier studies, patients with genuine family support, for example, asking someone to drive them to the doctor, tended not to experience a decline in quality of life.[53] In a cross-sectional study of 1,457 cancer patients, emotional and physical support were also highly associated with quality of life[54], while inadequate social support is closely related to depression.

The current study has some limitations; the database used was merely the Scopus database, which may not fully reflect the completeness, and false-negative results might still be possible. Therefore, future research should concentrate on merging many datasets. Study collaboration between developed and developing countries related to the health-related quality of life needs to be strengthened to facilitate study in resource-limited countries. However, this study has its advantages, as the first bibliometric analysis of peer-reviewed literature on health-related quality of life. Findings from this study might help international health authorities and grant agencies to discover gaps in health-related quality of life.

CONCLUSION

The USA, China, and Hong Kong are the top 3 nations with the most contributions to the social support in quality of life for breast cancer. Evidence was found for connections between the improvement of social support and an increase in breast cancer patients. Based on the Scopus database, bibliometric and visual analyses were conducted to study the characteristics of social support to improve their quality of life. This was conducted with research channels from 2001 to 2021 using 45 publications. Most publications come from the USA, followed by China and Hong Kong. Furthermore, the four domains used are instrumental support comprising of physical/medical assistance, financial, information support including advising and educating, and emotional support by empathizing. These domains are identified as a form of social support needed by breast cancer patients during therapy. Bibliometric analysis of literature may identify hot spot topics to provide significant knowledge in investigating the role of social support to the survival of cancer patients. Furthermore, the findings underlie the framework for developing studies on social support and quality of life to improve the survival of patients.

Data availability: Data may be shared upon contact of corresponding authors.

Conflict of interest: All authors declare no conflict of interest.

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