Thai Journal of Obstetrics and Gynaecology
September 2024, Vol. 32, No. 5, pp. 409-417.

GYNAECOLOGY

Surgical Outcomes of Laparoscopic High Uterosacral Vaginal Vault Suspension for Apical Prolapse Repair

Kreaingsak Sirisakpanich, M.D.*,
Setsayabongkorn Ruangsuwan, M.D.*,
Ploywarong Rueangket, M.D.*

** Department of Obstetrics and Gynecology, Phramongkutklao Hospital, Bangkok, Thailand*

ABSTRACT

Objectives: To evaluate surgical outcomes of laparoscopic high uterosacral ligament suspension (HUSLS) for apical prolapse repair in terms of success rates, perioperative complications, and the ability to perform concomitant bilateral salpingectomy/salpingo-oophorectomy.

Materials and Methods: This was a retrospective study of women diagnosed with stage II-IV uterovaginal prolapse who had undergone laparoscopic HUSLS for apical prolapse repair at Department of Obstetrics and Gynecology, Phramongkutklao Hospital between January 2017 and September 2020. Patients' baseline characteristics, clinical presentation, pre- and post-operative prolapse stage and location, pre- and post-operative pelvic organ prolapse quantification (POP-Q) measurements, perioperative complications, and feasibility of opportunistic salpingectomy/salpingooophorectomy were collected and analyzed.

Results: Of 40 patients enrolled, mean age was 62.3 ± 7.5 years, whereas mean body mass index was 24.7±3.2 kg/m^2. Most were postmenopausal (92.5%) and presented with bulge symptoms (97.5%). Thirty-five (87.5%) patients were diagnosed with advanced stage prolapse. All underwent hysterectomy prior to laparoscopic HUSLS. Additional procedures comprised anterior colporrhaphy (42.5%), posterior colporrhaphy (70%), perineorrhaphy (50%), and midurethral sling (5%). Bilateral salpingooophorectomy was performed in all patients. Mean operative time for all procedures was 3.1 ± 0.8 hours, whereas median blood loss was 50 milliliters. No major perioperative complications, including ureteric injury, were encountered. High anatomical success of 90% was achieved at 12-month follow-up with significant improvement in all POP-Q measurements, except perineal body (PB) and total vaginal length (TVL). Of 4 patients with recurrent prolapse, 3 later underwent total colpocleisis, whereas 1 required anterior vaginal mesh repair.

Conclusion: Laparoscopic HUSLS was a safe and effective procedure for apical prolapse repair without major perioperative complications when performed in the hands of experts.

Keywords: laparoscopic high uterosacral ligament suspension, apical prolapse repair, success rate, perioperative complications.

Correspondence to: *Kreaingsak Sirisakpanich, M.D., Department of Obstetrics and Gynecology, Phramongkutklao Hospital, Bangkok, Thailand. E-mail: suvit.b@chula.ac.th*

Received: 15 March 2023, **Revised:** 2 May 2024, **Accepted:** 7 May 2024

ผลลัพธ์ของการผ่าตัดส่องกล้องทางหน้าท้องในการรักษาอวัยวะอุ้งเชิงกรานหย่อนบริเวณส่วนยอดด้วยการยึดพยุงยอดช่องคลอดกับเอ็นยึดมดลูก uterosacral

เกรียงศักดิ์ ศิริศักดิ์พานิชย์, เศรษฐ์ญบงกร เรืองสุวรรณ, พลอยวรงค์ เรืองเกตุ

บทคัดย่อ

วัตถุประสงค์: *เพื่อศึกษาอัตราความสำเร็จของการผ่าตัดส่องกล้องทางหน้าท้องในการรักษาอวัยวะอุ้งเชิงกรานหย่อนบริเวณส่วนยอดด้วยการยึดพยุงยอดช่องคลอดกับเอ็นยึดมดลูก uterosacral ได้แก่ อัตราความสำเร็จในเชิงกายวิภาคและอาการทางคลินิก อัตราการเกิดภาวะแทรกซ้อนในขณะผ่าตัดและภายหลังการผ่าตัด และอัตราการกลับเป็นซ้ำของภาวะกระบังลมหย่อนหลังจากการผ่าตัด*

วัสดุและวิธีการ: *ศึกษาย้อนหลังจากเวชระเบียนของผู้ป่วยที่ได้รับการวินิจฉัยว่ามีภาวะอวัยวะอุ้งเชิงกรานหย่อนอย่างน้อยระดับ 2 และได้รับการรักษาอวัยวะอุ้งเชิงกรานหย่อนบริเวณส่วนยอด (apical compartment prolapse) ด้วยการยึดพยุงยอดช่องคลอดกับเอ็นยึดมดลูก uterosacral (High uterosacral ligament suspension : HUSLS) โดยวิธีผ่าตัดส่องกล้องทางหน้าท้อง ณ อนุสาขานรีเวชทางเดินปัสสาวะและผ่าตัดซ่อมเสริมอุ้งเชิงกราน โรงพยาบาลพระมงกุฎเกล้า ตั้งแต่ เดือน มกราคม 2560 ถึง เดือน สิงหาคม 2564 โดยศึกษาและวิเคราะห์ข้อมูลทั่วไป อาการแสดง ค่า พอปคิว (POP-Q) ก่อนและหลังผ่าตัด ตำแหน่งที่มีภาวะอุ้งเชิงกรานหย่อน รวมถึงภาวะแทรกซ้อนระหว่างและหลังการผ่าตัด*

ผลการศึกษา: *เก็บข้อมูลผู้ป่วย 40 รายที่ได้รับการผ่าตัด HUSLS อายุเฉลี่ยคือ 62.3 ±7.5 ปี โดยผู้ป่วยได้รับการผ่าตัดส่องกล้องทางหน้าท้องเพื่อตัดมดลูกร้อยละ 95 และทำการผ่าตัดมดลูกทางช่องคลอดร้อยละ 5 ผู้ป่วยได้รับการผ่าตัดรังไข่ทั้งสองข้างร้อยละ 100 นอกจากนี้หัตถการที่ทำร่วมกันในระหว่างผ่าตัดได้แก่ การผ่าตัดซ่อมเสริมผนังช่องคลอดด้านหน้า ร้อยละ 42.5, การผ่าตัดซ่อมเสริมผนังช่องคลอดด้านหลัง ร้อยละ 70, การผ่าตัดใส่สายคล้องใต้ท่อปัสสาวะส่วนกลาง ร้อยละ 5 โดยทั้งหมดทำตามข้อบ่งชี้ ค่าพอปคิวหลังการผ่าตัดมีค่าน้อยกว่าก่อนผ่าตัดอย่างมีนัยสำคัญทางสถิติ ในจุด Aa, Ba, C, Ap, Bp and Gh พบว่าอัตราความสำเร็จของการผ่าตัดในการศึกษานี้อยู่ที่ร้อยละ 90 อัตราการกลับเป็นซ้ำอยู่ที่ร้อยละ 10*

สรุป: *การผ่าตัดส่องกล้องทางหน้าท้องด้วยการยึดพยุงยอดช่องคลอดกับเอ็นยึดมดลูก uterosacral มีประสิทธิภาพที่ดีและปลอดภัยสำหรับการแก้ไขภาวะอุ้งเชิงกรานหย่อนบริเวณส่วนยอด โดยมีอัตราการเกิดภาวะแทรกซ้อนต่ำทั้งระหว่างและหลังผ่าตัด รวมทั้งมีอัตราการกลับเป็นซ้ำอยู่ในระดับที่ต่ำ*

คำสำคัญ: *อวัยวะอุ้งเชิงกรานหย่อน, การยึดพยุงยอดช่องคลอด, มาตรวัดพอปคิว, การผ่าตัดส่องกล้องยึดพยุงยอดช่องคลอดกับเอ็นยึดมดลูก*

Introduction

According to the definition by the International Urogynecological Association (IUGA)/International Continence Society (ICS) joint report on the terminology, pelvic organ prolapse (POP) is the descent of one or more of the anterior vaginal walls, the posterior vaginal wall, the uterus (cervix) or the apex of the vagina after hysterectomy[1]. With Thailand becoming an aging society, POP has become highly prevalent among women of advanced age, causing a negative impact on their quality of life. Due to increasing age, the pelvic floor gradually deteriorates leading to weakness in all or multiple coexisting compartments[2]. With the development of surgical techniques and perioperative care, most women are rather inclined towards surgical repair rather than conservative treatment. Unfortunately, nearly one-third of the women undergoing surgery for POP later required a second operation for POP recurrence[3]. Hence, to achieve anatomical success in POP repair and prevent prolapse recurrence, all pelvic supportive defects must be thoroughly identified and effectively corrected at the time of the index surgery, specifically apical support restoration which is the key to a successful prolapse repair[4, 5]. Different surgical treatments for apical prolapse repair can be performed via vaginal, abdominal, or laparoscopic route with the mutual aim of restoring the vaginal apex to its usual position using ligament fixation, with or without mesh augmentation. Examples include (1) sacrospinous ligament (sacrospinous fixation), (2) presacral ligament (sacrocolpopexy), (3) Cooper's ligament (pectopexy), (4) round ligament (round ligament suspension), and (5) uterosacral ligament (uterosacral ligament suspension).

According to Delancey's fascial support theory[6], re-suspending of the apical compartment to the intact cardinal/uterosacral ligament complex at the level of ischial spine, called high uterosacral ligament suspension (HUSLS), can provide a strong support to the vaginal apex without distorting its axis and no additional need for mesh augmentation. This is often performed after hysterectomy procedure, either vaginally, abdominally, or laparoscopically, with high success rates[7]. However, an important disadvantage of the transvaginal HUSLS is the possible risk of ureteric injury, approximately 1-11%[8]. To avoid ureteric complication, HUSLS can be conducted via laparoscopic approach which can aid in clear visualization and identification of both ureters and uterosacral ligaments, therefore providing solid and safe apical suspension. Moreover, opportunistic bilateral salpingectomy and/or oophorectomy can be readily achieved to eliminate the risk of future tubo-ovarian cancer[9]. Nevertheless, there are unavoidable drawbacks of laparoscopy, especially high cost and the need for advanced skills in minimally invasive surgery. As one of The Royal Thai College of Obstetricians and Gynaecologists (RTCOG) affiliated training center, Phramongkutklao Minimally Invasive Gynecologic Surgery (MIGS) Unit is responsible for providing and offering various and standardized minimally invasive procedures, including pelvic floor reconstruction, to our patients and trainees. Laparoscopic HUSLS is one of the common urogynecological procedures performed to correct apical descent at our center. Therefore, this study primarily aimed to evaluate the surgical outcomes of laparoscopic HUSLS for apical prolapse repair in terms of success rates and perioperative complications, as well as to assess the ability in performing concomitant bilateral salpingooophorectomy procedure.

Materials and Methods

After receiving an ethical approval from the Institutional Review Board of Phramongkutklao Hospital, the medical records of the patients diagnosed with at least stage II uterovaginal prolapse who had undergone laparoscopic high uterosacral vaginal vault suspension at the Minimally Invasive Gynecologic Surgery Unit, Department of Obstetrics and Gynecology, Phramongkutklao Hospital between January 2017 and September 2020 were retrospectively reviewed. Information regarding patients' baseline characteristics, clinical presentation, pre- and post-

operative POP staging and location, pre- and post-operative POP-Q measurements, operative outcomes, and perioperative adverse events were collected and analyzed. Cases with incomplete medical data and follow-up duration of less than 1 year were excluded from the study.

Sample size calculation

According to the literature review, the anatomical cure rate of laparoscopic HUSLS was 76-100%[10, 11]. The expected success rate for this study was then assumed to be 90%. With the pre-defined values of (1) Z-alpha/2 score at the confidence level of 95% (1.96), (2) 90% expected success rate of laparoscopic HUSLS (0.90), and (3) 10% discrepancy (0.09), the sample size was finalized at 43 patients for this study.

Surgical techniques

Only one experienced urogynecologist (KS) was responsible for all carried-out surgical procedures. Hysterectomy, either vaginal or laparoscopic, was performed prior to laparoscopic HUSLS procedure. For laparoscopic port entry, a primary 10-mm trocar was introduced at umbilicus for camera port, followed by three additional 5-mm trocars placed at left lower, suprapubic and right lower abdominal areas for ancillary ports. After either vaginal or laparoscopic hysterectomy, bilateral salpingooophorectomy was performed for the patients who had already approached menopause. Regarding the details for laparoscopic HUSLS procedure, the initial step was to enter the retroperitoneal space to clearly visualize and lateralize both ureters away from the peritoneal fold covering uterosacral ligaments. Retroperitoneal dissection was continued into pararectal space to medialize the rectum and clearly identify the fibers of both uterosacral ligaments at the level of ischial spine. The long-term absorbable polydioxanone suture material (1-0 Monomax®) which was inserted from the vagina was used to make a suspensory suture between each uterosacral ligament and the ipsilateral vaginal cuff corner. The suture ends were then retrieved back into the vagina. After closure of the vaginal cuff with the mid-term absorbable braided and coated synthetic suture material (1-0 Novosyn®), both uterosacral suspensory sutures were then tied vaginally. Additional procedures including anterior colporrhaphy, posterior colporrhaphy, perineorrhaphy, and midurethral sling were also carried out if needed. The Foley's catheter was removed on postoperative day 1.

The patients were scheduled for postoperative follow-up at 1 month, 3 months, 6 months, 12 months and annually thereafter. POP stage and location, as well as POP-Q measurements were re-evaluated at each follow-up visit. With the success rate being the primary objective of this study, we defined the anatomical success at one-year follow-up according to the NICHD (National Institute of Child Health and Human Development) Pelvic Floor Disorders Network recommendations[12] as "no descent of the vaginal walls beyond the hymen" or POP-Q measurements Aa, Ap, Ba, Bp and C less than or equal to 0. Moreover, we secondarily evaluated the perioperative complications and assessed the feasibility of opportunistic bilateral salpingooophorectomy among our patients.

Statistical analysis

The statistical analysis was performed using the Statistical Packages for the Social Sciences version 23.0 for Windows (SPSS Inc, Chicago, IL, USA). Continuous data were described as mean ± standard deviation (SD), median (range), or median with interquartile range (IQR) whereas categorical variables were expressed as number and percentage. The paired Student t-test or Wilcoxon signed-rank test was used to assess the significance of the difference between pre- and post-operative POP-Q measurements. The p value of less than 0.05 was used to determine statistical significance.

Results

A total of 40 patients having undergone laparoscopic HUSLS procedure during the study

period were recruited. Among these, 92.5% were postmenopausal with the mean age of 62.3 ± 7.5 years and the mean body mass index (BMI) of 24.7 ± 3.2 kg/m^2. With the median parity of 2, 95% of the patients had vaginal deliveries. "Feeling of a bulge" was the most common presenting symptom among our patients (97.5%). Regarding POP-related lower urinary tract symptoms, both voiding difficulty and stress urinary incontinence (SUI) were reported in one-third of the patients. Only a few patients complained of defecatory symptoms. Regarding preoperative POP stage, 35 out of 40 patients (87.5%) initially presented with advanced stage (stage 3-4) prolapse (Table 1).

Table 1. Baseline characteristics.

Characteristics	Values (n = 40)
Age (years)	62.3 ± 7.5
BMI (kg/m^2)	24.7 ± 3.2
Parity	2 (0-6)
Mode of delivery	
NL	38 (95.0)
V/E	1 (2.5)
F/E	1 (2.5)
C/S	2 (5.0)
Menopause	37 (92.5)
POP symptom	
Bulge	39 (97.5)
Dragging	2 (5.0)
LUT symptom	
Voiding difficulty	13 (32.5)
OAB	8 (20.0)
SUI	12 (30.0)
Digitation	2 (5.0)
Bowel symptom	
Constipation	1 (2.5)
Incomplete evacuation	2 (5.0)
Straining	1 (2.5)
Digitation	3 (7.5)
POP Stage	
Stage 0-1	0 (0.0)
Stage 2	5 (12.5)
Stage 3-4	35 (87.5)

Data presented as mean ± standard deviation, median (min, max) or number (%).
BMI: body mass index, POP: pelvic organ prolapse, LUT: lower urinary tract, OAB: overactive bladder, SUI: stress urinary incontinence, NL: normal labour, V/E: vacuum extraction, F/E: forceps extraction, C/S: cesarean section.

All patients underwent hysterectomy prior to laparoscopic high uterosacral vault suspension procedure, 38 laparoscopically and 2 vaginally. The mean operative time for all conducted procedures was 3.1 ± 0.8 hours, whereas the median intraoperative blood loss was 50 milliliters, ranging from 10 to 350 milliliters. No major intraoperative adverse events, especially ureteric injury, were encountered. Bilateral salpingooophorectomy was successfully performed in every patient. Other concomitant procedures comprised anterior colporrhaphy (42.5%), posterior colporrhaphy (70%), perineorrhaphy (50%), and midurethral sling (5%). Fever was found to be the most common early postoperative complication which could spontaneously resolve after close monitoring. For one patient having acute urinary retention postoperatively, this occurred after midurethral sling placement and subsequently required loosening of the tape. De novo stress incontinence was discovered in 5 out of 40 patients (12.5%). Fortunately, this could be conservatively managed without the need to undergo anti-incontinence surgery (Table 2).

Table 2. Operative outcomes and perioperative complications.

Perioperative variables	Values (n = 40)
Operative outcomes	
Operative time (hour)	3.1 ± 0.8
Blood loss (ml)	50 (10 – 350)
V-hysterectomy	2 (5.0)
TLH	38 (95.0)
Bilateral S/SO	40 (100.0)
Midurethral sling	2 (5.0)
Anterior colporrhaphy	17 (42.5)
Posterior colporrhaphy	28 (70.0)
Perineorrhaphy	20 (50.0)
Perioperative complications	
Fever	4 (10)
Urinary retention	1 (2.5)
De novo SUI	5 (12.5)

Data presented as mean ± standard deviation, number (%), median (min, max)
TLH: total laparoscopic hysterectomy, S: salpingectomy, SO: salpingooophorectomy, SUI: stress urinary incontinence, V-hysterectomy: vaginal hysterectomy.

At 12-month follow-up, substantial improvement in bulge symptom and POP-Q measurements were readily observed. The comparative outcome of pre- and post-operative POP-Q measurements revealed statistically significant improvement in all compartments, including anterior (point Aa and Ba), posterior (point Ap and Bp), and apical (point C), as well as smaller genital hiatus (Gh) (all with p value < 0.001). However, no significant changes were detected in the perineal support (p = 0.520) and total vaginal length (p = 0.124) (Table 3). These comparative outcomes are also illustrated for easy understanding in Fig. 1.

With the hymen being referenced as the cut-off point to objectively define POP recurrence, 4 patients (10%) were found to have recurrent prolapse. When specifically investigating for the location of POP recurrence, 3 patients presented

with advanced stage anterior and apical prolapse, whereas 1 patient demonstrated only stage 2 apical descent. Thus, the anatomical success rate of laparoscopic HUSLS for apical prolapse repair was 90%. Finally, of 4 patients diagnosed with recurrent prolapse, three later underwent total colpocleisis while one eventually required anterior vaginal mesh repair.

Table 3. Pre- and post-operative POP-Q measurements.

POP-Q	Preoperative	Postoperative	Mean difference	95% CI		p value
			Lower	Upper		
Aa	+1.1 ± 1.6	-2.0 ± 1.0	3.1	2.5	3.7	< 0.001
Ba	+2.8 ± 1.7	-2.0 ± 1.4	4.9	4.2	5.5	< 0.001
C	+3.1 ± 3.0	-4.7 ± 2.1	7.8	6.6	9.0	< 0.001
Ap	-0.7 ± 2.0	-2.7 ± 0.7	2.0	1.4	2.6	< 0.001
Bp	-0.4 ± 2.5	-2.7 ± 0.7	2.3	1.5	3.0	< 0.001
Gh	4.0 ± 1.0	2.8 ± 0.6	1.1	0.9	1.4	< 0.001
Pb	3.2 ± 0.7	3.2 ± 0.6	0.0	-0.2	0.3	0.520
TVL	7.3 ± 1.0	7.2 ± 0.7	0.2	-0.1	0.4	0.124

Data presented as mean ± standard deviation, Statistical analysis: Wilcoxon signed ranks test.
POP-Q: pelvic organ prolapse quantification, CI: confidence interval.

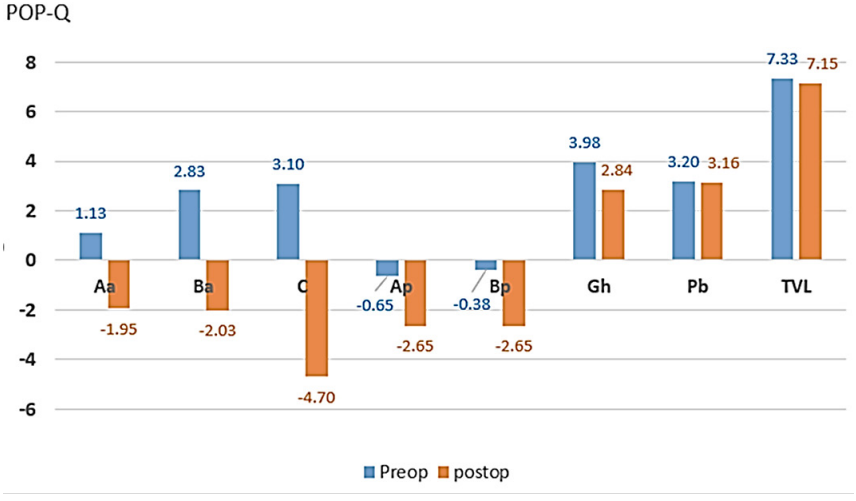

Fig. 1. Comparative outcome of pre- and post-operative POP-Q measurements.
POP-Q: pelvic organ prolapse quantification

Discussion

The favorable anatomical success rate of 90% from this study has confirmed the effectiveness of laparoscopic HUSLS procedure in the apical prolapse repair. The result was similar to those of several previous research works[10,11]. Apart from laparoscopic re-suspension of the vaginal apex, concomitant vaginal procedures, including anterior and posterior colporrhaphy, were also conducted in order to correct the supportive defect in the anterior and posterior

compartment, respectively. This definitely led to remarkable improvement of POP-Q measurements in all three compartments, except the perineal body (Pb) and the total vaginal length (TVL). Since perineorrhaphy was less likely performed among our patients, this could contribute to the non-significant change in the thickness of the perineal body. Although the descending vaginal apex (point C) could be significantly lifted up and brought back to its usual position, the vaginal length remained the same, resulting in unchanged TVL value.

Results from our study have also proved the benefits of laparoscopy. With the advantage of better visualization and lateralization of the ureter, no ureteric injury was encountered. Moreover, laparoscopic approach could undoubtedly facilitate the safe removal of both adnexa (bilateral salpingooophorectomy) in all patients. This could be beneficial for postmenopausal women in terms of eliminating the risk of future tuboovarian cancer[9]. Although no major intraoperative complications were encountered, the late postoperative stress incontinence or 'de novo SUI' seemed to be an unavoidable incident. Our 12.5% occurrence of de novo SUI reflects the results of several previous studies[13-15]. It was suggested that POP could cause urethral kinking and POP repair could subsequently restore the normal urethral anatomy, unmasking the symptom of SUI that was covertly present before the operation.

Previous literatures have determined the strong association between anterior and apical compartment prolapse[4, 16-17]. Our findings have also highlighted this relationship. Among 4 patients diagnosed with recurrent POP, 3 (75%) were found to have recurrent anterior prolapse together with apical descent. The nature of unsustainable native tissue repair and inadequate endopelvic fascial plication were the possible causes of POP recurrence.

Strength and limitation

With only one urogynecologist who was highly experienced in both laparoscopic and transvaginal pelvic floor reconstruction, the strength in terms of uniform and standardized surgical techniques could be ensured. Furthermore, expertise skills in laparoscopic retroperitoneal dissection could facilitate clear identification of both ureters and cardinal-uterosacral complex, thus providing a safe and sound fixation on the ligaments without any doubt of ureteric injury. All of these could, therefore, resulted in favorable surgical outcomes. However, the small sample size and the retrospective nature of this study were unavoidable limitations causing measurement and patient selection bias.

Implementation

With expertise skills in laparoscopic retroperitoneal dissection, our study has provided an effective technique in identification of both ureters and the exact location of the uterosacral ligaments. Hence, this confirmed a safe and definitive placement of the suspensory sutures onto the ligaments, ensuing a secure apical suspension and a high anatomical success. Our surgical technique was different from the intraperitoneal plication of peritoneal fold covering uterosacral ligaments which was the technique utilized by most researchers. Therefore, this retroperitoneal dissection technique can be implemented or added to the established knowledge of laparoscopic high uterosacral vault suspension.

Conclusion

Laparoscopic high uterosacral vaginal vault suspension was a safe and highly effective procedure for apical prolapse repair with minimal complications, especially when performed in the hands of experts.

Acknowledgement

The authors wish to acknowledge Assistant Professor Pattaya Hengrasmee for her advice and contribution in English editing of the manuscript.

Potential conflicts of interest

The authors declare no conflicts of interest.

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