Original article

Early outcome and feasibility of ambulatory inguinal herniorrhaphy in single institute

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Abstract:

Introduction: *Inguinal hernia is one of common surgical diseases in Thailand and conventionally treated by in-patient surgery department. Because the surgery is performed under spinal anesthesia, it requires two overnight hospital stays. While, ambulatory or one-day herniorrhaphy has been shown to be an alternative standard approach in other institutes over two decades and has gained more recognition as it provides the same result with less resource used. The author aimed to evaluate the practicality of this surgical method in the institutes.* ***Objective:*** *This study intended to determine the success rate and feasibility of ambulatory or day-case hernia surgery at Phramongkutklao Hospital. The Lichtenstein repair under local anesthesia (ambulatory group) was compared to the conventional approach (control group) which is a repair under spinal or general anesthesia.* ***Materials and methods:*** *This study was designed as a prospective cohort study by enrollment of all patients with unilateral inguinal hernia who obtained surgery between October 2018 and April 2019. The inclusion criteria were adult patients with Nyhus classification 1-3B with voluntary consent that were purposive sampling assigned to either ambulatory or conventional groups by surgeon preference technique. Ambulatory hernia protocol is composed of preemptive pain control, local inguinal nerve block, optional deep sedation, and post anesthetic discharge score (PADS) evaluation before discharge. The pre-determined PADS score higher than 9 was the criteria for hospital discharge. Outcome variables included duration of surgery, early postoperative complication, hospital cost, resumed normal activities, and 30-day complication.* ***Results:*** *The ambulatory group was composed of 29/125 patients (23.2%), of which 93.1% of this group were discharged within the same day. Failure of two cases were caused by a low PADS score and an asthmatic attack with necessitated overnight observation. Compare to the conventional group, the ambulatory group, who are younger ($p = 0.012$), had shorter operative time (75 vs 90 mins, $p = 0.005$), and had faster resumed daily activities (5 vs 7 days, $p < 0.001$), were observed without significant differences in early complication and hospital cost.* ***Conclusion:*** *This study was an evidence to prove that inguinal herniorrhaphy performed on one-day technique is as safe and effective as conventional spinal anesthesia technique.*

Keywords: ● *Inguinal herniorrhaphy* ● *One day surgery* ● *Ambulatory surgery*

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นิพนธ์ต้นฉบับ

การศึกษาผลการผ่าตัดและความเหมาะสมของศัลยกรรมไส้เลื่อนขาหนีบแบบวันเดียวกลับ

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บทคัดย่อ

บทนำ *การผ่าตัดรักษาไส้เลื่อนขาหนีบ ด้วยวิธีทางศัลยกรรมแบบวันเดียวกลับ ได้รับความนิยมมากขึ้นตามลำดับในช่วงที่ผ่านมา เนื่องจากมีผลการรักษาที่ไม่แตกต่างจากการผ่าตัดที่ต้องเข้ารับการรักษาแบบผู้ป่วยใน* ***วัตถุประสงค์*** *เพื่อศึกษาอัตราความสำเร็จ และผลลัพธ์การรักษาของการผ่าตัดไส้เลื่อนขาหนีบแบบวันเดียวกลับ ด้วยเทคนิค Lichtenstein ด้วยการฉีดยาชาเฉพาะที่ เปรียบเทียบกับวิธีดั้งเดิม* ***วิธีการ*** *ผู้ป่วยที่เข้ารับการรักษาไส้เลื่อนขาหนีบ ช่วงเดือนตุลาคม พ.ศ. 2561 ถึง เมษายน พ.ศ. 2562 ที่อายุมากกว่า 20 ปี, Nyhus class 1-3B จะได้รับการผ่าตัดด้วยเทคนิคแบบวันเดียวกลับ หรือแบบปกติ ขึ้นกับความยินยอมของผู้ป่วยและความถนัดของศัลยแพทย์ (purposive sampling) โดยกลุ่มศึกษาจะได้รับการให้ยาแก้ปวดในแบบ preemptive การฉีดยาชาเฉพาะที่ร่วมกับ sedation ขณะผ่าตัด จากนั้นจะได้รับการประเมิน Post anesthetic discharge score (PADS) ก่อนกลับบ้าน ทำการติดตามภาวะแทรกซ้อนและอาการปวดหลังการผ่าตัดในเดือนแรก รวมถึงระยะเวลาที่สามารถดำเนินกิจกรรมต่างๆ ได้ตามปกติ* ***ผลการวิจัย*** *ผู้ป่วยที่เข้ารับการผ่าตัดไส้เลื่อนขาหนีบทั้งหมดจำนวน 125 ราย ได้รับการผ่าตัดแบบวันเดียวกลับจำนวน 29 ราย (23.2%) มีอัตราความสำเร็จอยู่ที่ 93.1% การวิเคราะห์ทางสถิติพบว่า กลุ่มศึกษามีอายุน้อยกว่า (50 Vs 62 ปี $p = 0.012$), ระยะเวลาการผ่าตัดสั้นกว่า (75 Vs 90 นาที, $p = 0.005$) และ ดำเนินกิจกรรมตามปกติได้เร็วกว่า (5 Vs 7 วัน $p < 0.001$) โดยที่ภาวะแทรกซ้อนหลังผ่าตัด รวมถึงค่าใช้จ่ายไม่มีความแตกต่างกัน* ***สรุป*** *การผ่าตัดไส้เลื่อนขาหนีบแบบวันเดียวกลับ มีความปลอดภัยและมีผลลัพธ์การรักษาไม่แตกต่างจากการผ่าตัดแบบรับไว้เป็นผู้ป่วยใน*

คำสำคัญ: ● *ไส้เลื่อนขาหนีบ* ● *การผ่าตัดวันเดียวกลับ*

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Introduction

The life-time prevalence of inguinal hernia is estimated as 25% and 2% in male and female, respectively. The bimodal distribution is at the age of first year and after 40 years[1]. Surgery is the main stay of treatment of this common disease. Herniorrhaphy in adult is one of the most frequent operations globally performed and reported as 28 and 10 patients per 100,000 population[2]. The incidence of recurrence and complications after surgery is 2-3% with both opened and endoscopic techniques[3]. When an inguinal hernia becomes symptomatic, mesh repair is frequently used in the surgery to strengthen the weak abdominal wall in the groin area. The European Hernia Society[4] and the International Guidelines for Groin Hernia Management[5] support local anesthesia (LA) as one of the intra-operative anesthetic approaches for elective herniorrhaphy. The evidence found that LA has advantages over general anesthesia or spinal blockage, such as decreased postoperative pain, a shorter hospital stays, shorter convalescence period, and fewer post-anesthetic complications. Therefore, it is regarded as a standard practice for patients with a body mass index (BMI) of less than 40 kg/m^2 who are not very anxious. Following open inguinal hernia surgery, early post-operative complications include hematoma, surgical site infection, neuralgia, testicular inflammation, and urinary retention. Chronic groin pain, which affected 10.7-21.7% of individuals, is the most severe adverse effect,while 24% have an effect on daily activities[6].

The utilization of this effective local anesthesia combined with appropriate surgical techniques enables Phramongkutklao Hospital to provide one-day surgery (ODS) service, also known as ambulatory surgery for the treatment of inguinal hernias, which is defined as the patient coming in for surgery and leaving on the same day or within the duration of less than 24 hours. The workload involved in admitting patients for inpatient treatment is lessened by the ODS policy that allows the hospital staff to address other patients who have complex surgical procedures. The Ministry of Public Health endorses inguinal herniorrhaphy as one among 12 procedures in ODS fashion in Governmental Public Health Policy 4.0[7]. The popularity of day-case herniorrhaphy continues to grow attributable to its higher patient flow, lower staffing and operating room costs, and more individualized services. It accounts for 85% of scheduled hernia operations in the United States, followed by 75, 70, 65, and 50 percent for Denmark, Sweden, Norway, and England, respectively[8]. However, all patients undergoing elective herniorrhaphy at our institute are still admitted to the hospital overnight before operative day, and the anesthetic technique is either spinal or general anesthesia. The study's objective was to evaluate the safety and feasibility of one-day Lichtenstein herniorrhaphy outcome results in terms of early post-operative complication, in comparison with the traditional approach, as well as the overall demographic and clinical parameters influencing the rate of succession.

Materials and methods

Study design and Subjects

This prospective cohort study was carried out at Pramongkutklao Hospital from October, 1 2018 to April 30, 2019. The indication for elective inguinal herniorrhaphy was clinically documented symptomatic unilateral inguinal hernia, without emergency complication such as incarcerated conditions. ODS herniorrhaphy was offered to 29 patients who met the established inclusion criteria: age 18-80 years, American Society of Anesthesiology (ASA) classification class I-III, Nyhus classification of type 1-3b (Table 1), patient voluntary consent, body mass index (BMI) of less than 30 kg/m^2, and an available adult to accompany the patient while staying at home overnight. All patients were informed about pre-operative

Table 1 Nyhus classification of groin hernia

Type	Clinical characteristics
1	Indirect, normal ring, sac in the canal
2	Indirect, enlarged internal ring, intact posterior wall, sac in the canal
3a	Direct, only posterior wall defect
3b	Indirect, enlarged internal ring, posterior wall defect

preparedness and same-day discharge protocol. The ethics committee of Pramongkutklao Hospital approved the study protocol, and all participants provided written informed consent.

Patient's medical history, physical examination, and standard laboratory test results were assessed during the preoperative period. Based on individual patient and surgeon preference, participants who voluntarily consented to obtain the ODS service were examined by a consultant anesthesiologist at an outpatient clinic with pre-emptive medication prescription and scheduled on a morning list before 11:00 am in order to permit sufficient time for patient recovery prior to evening discharge. Other hernia patients who desired routine care were scheduled for surgery under either spinal or general anesthesia and with regular overnight post-operative hospital stays.

Surgical intervention

Surgery was performed by consultant surgeons for the ODS group and by consultants or senior residents for the control group, as described in original Lichtenstein technique[9]. In the operating room, all patients were given intravenous short-acting hypnotic and sedation with analgesics for conscious sedation on anesthesiologist discretion, along with laryngeal mask airway management as needed. The patient was positioned supine and usual preparations were undertaken to the groin. Bupivacaine and xylocaine mixture was locally administered at the incision plane to provide local anesthesia. After the skin, subcutaneous tissue, and Scarpa's fascia are incised to the external oblique aponeurosis, a 10-mL of anesthetic medication was infiltrated directly into the inguinal canal. The roof of inguinal canal was opened to identified ilioinguinal nerve and spermatic cord. Lipoma of the cord was removed if presented. In indirect hernias, the hernial sac was dissected to the internal ring and ligated and its distal portion was usually left opened while in direct hernia, excessive protrusion of floor was imbricated with non-absorbable sutures.

The tension-free herniorrhaphy constructed from synthetic mesh was first sutured to the public tubercle with 2-cm overlapping using a 2-0 nylon suture. The surgical mesh was trimmed to fit the anatomy of inguinal floor and then the lower border of the mesh was sutured to the free edge of the inguinal ligament up just medial to the anterior superior iliac spine. The spermatic cord was accommodated by mesh-tail crossing at internal ring level. The mesh was sutured to the conjoined tendon with iliohypogastric nerve precaution. After meticulous hemostasis, the aponeurosis of external oblique and surgical incision were then closed absorbable sutures.

Post-operative care conducted at an observation area. The patient was endorsed to walk about four hours after surgery and was assessed before discharge using the Revised postanesthetic discharge scoring system (PADS, Table 2) by a surgical resident. The PADS score equal or higher than 9 was the criteria to discharge and the medical advice for home observation with immediate revisiting point-of-contact was provided to the patient and their accompany. Patients with post-operative complications or PADS score less than 9 were admit to the hospital for patient safety. Follow-up was done by

Table 2 The revised post-anesthetic discharge scoring system (PADS)

	Revised postanesthetic discharge scoring system (PADS)	**score**
Vital sign	Within 20% of preoperative baseline	2
	20-40% of preoperative baseline	1
	40% of preoperative baseline	0
Activity level	Steady gait, no dizziness, consistent with preop level	2
	Requires assistance	1
	Unable to ambulate/assess	0
Nausea/vomiting	Minimal: mild, no treatment needed	2
	Moderate: treatment effective	1
	Severe: treatment not effective	0
Pain	VAS = 0-3 the patient has minimal or no pain prior to discharge	2
	VAS = 4-6 the patient has moderate pain	1
	VAS 7-10 the patient has severe pain	0
Surgical bleeding	Minimal: does not require dressing change	2
	Moderate: required up to two dressing changes with no further bleeding	1
	Severe: required three or more dressing changes and continues bleed	0
Total score	**Total score**	

clinical examination on an outpatient basis one week after operation.

Statistical Analysis

All analyses were performed with the STATA/MP 12 for a Windows program. Descriptive statistics were presented in formats of percentage, mean, standard deviation, and others for statistical analysis of patient characteristics. Continuous variables were analyzed using independent t-test or Mann-Whitney U test, PADS score, and operative time. Categorical variables such as post-operative complications were compared using Fisher exact test or Chi-square test. The p-value of < 0.05 was considered as statistical significance.

Results

During the study period, 29 of 125 patients underwent elective herniorrhaphy at our institution participated in the ODS surgery service, all were male. Patients in the two group were with comparable regarding age, underlying chronic disease and BMI as shown in Table 3. The mean age of the ODS group was 50.3±21.7 years, significantly less than that of the control group (62±18.1 years). The majority of patients in both groups were American Society of Anesthesia class II and the remainder were ASA class I, however there were more ASA class III in the control group. For the study group, the most frequent diagnosis was right indirect inguinal hernia (51.7%) followed by left indirect type (34.5%), while pantaloon type was the least common in both groups (3%). In terms of Nyhus categorization, ODS patients were more likely to have class I (indirect type) and less likely to have class III (direct type) than the control group, although the difference in surgical difficulties was not clinically meaningful.

The surgical consultants performed all ODS herniorrhaphy and most of operations in the control group were performed by senior residents. No patients in the study group converted to general anesthesia because

Table 3 Patient Demographic and Characteristics

Characteristics	One day surgery (n = 29)	SA / GA (n = 96)	*p*-value
Age (year), mean±SD	50.31±21.78	62.03±18.14	0.012*
BMI (kg/m2), mean±SD	22.30±2.68	23.35±3.18	0.111
ASA classification, n(%)			
I	13 (44.8)	22 (22.9)	0.016*
II	16 (55.2)	60 (62.5)	
III	0 (0.0)	14 (14.6)	
Underlying disease, n (%)			
Hypertension	12 (41.4)	49 (51.0)	0.362
Diabetes mellitus	4 (13.8)	12 (12.5)	0.855
Dyslipidemia	4 (13.8)	15 (15.6)	0.810
Cerebrovascular disease	1 (3.4)	8 (8.3)	0.372
Diagnosis, n (%)			
Right indirect inguinal hernia	15 (51.7)	38 (39.6)	0.371
Left indirect inguinal hernia	10 (34.5)	31 (32.3)	
Right direct inguinal hernia	1 (3.4)	16 (16.7)	
Left direct inguinal hernia	2 (6.9)	7 (7.3)	
Left pantaloon	1 (3.4)	1 (1.0)	
Right pantaloon	0 (0.0)	3 (3.1)	
Nyhus classification, n(%)			
I	10 (34.5)	12 (12.5)	0.028*
II	14 (48.3)	56 (58.3)	
III A	3 (10.3)	24 (25.0)	
III B	2 (6.9)	4 (4.2)	

* statistically significant difference at the 0.05 level. Data were analyzed with Independent t-test and Chi-square test

Table 4 Operative time and early post-operative complications

	One day surgery (n = 29)	SA / GA (n = 96)	p-value
Duration of surgery (min), median (IQR)	75 (60-95)	90 (75-110)	0.005*
Complication, n (%)			
Urinary retention	0 (0.0)	5 (5.2)	0.589
Hematoma	2 (6.9)	2 (2.1)	0.230
Neuralgia	1 (3.4)	6 (6.3)	1.000
Surgical Site Infection	0 (0.0)	3 (3.1)	1.000
Seroma	0 (0.0)	9 (9.4)	0.116
Resumed normal activities of daily living (day)	5 (5-7)	7 (7-7)	< 0.001*
Recurrence at 30 days, n (%)	0 (0.0)	1 (1.0)	1.000

data were analyzed with Fisher exact test

Table 5 Comparison of medical expenses

	One day surgery (n = 29)	SA / GA (n = 96)	*p*-value
Medical expense (Thai Baht), median (IQR)			
Medical supplies	2,524 (2,010-2,971)	2,515 (2,075-3,218)	0.543
Surgery / anesthesia	8,375 (6,600-9,000)	7,300 (6,850-8,200)	0.075
Patient room	600 (480-1,350)	1,200 (480-1,800)	0.164
Food	400 (320-800)	800 (320-800)	0.024*
Laboratory / X-ray	585 (222.5-1,051)	280 (140-490)	0.151
Medical examination	670 (300-710)	770 (670-1,020)	< 0.001*
Other	50 (50-150)	100 (50-100)	0.581
Total	11,792 (11,185-15,744)	13,525 (11,867-14,845)	0.207

*statistically significant difference at the 0.05 level. Data were analyzed with Mann-Whitney test

of intolerance of the procedure under this sedation and local technique. After operation, 27 out of 29 patients (93%) were successfully discharged except two patients, one was admitted to the hospital due to acute asthmatic attack while the other was admitted due to excessive pain and his PADS score was less than 8. The median duration of surgery (as total time recorded in anesthetic record) was shorter in the ODS group (75 Vs 90 min, $p = 0.005$). Table 4 also showed the number of early post-operative complications that was a few in both group. The procedures performed in inpatient manner apparently show more frequent urinary retention, seroma and surgical site infection however, the difference was not significant. It was clear from the table that resumed normal activities of daily living was faster for the ODS group than the control group (5 Vs 7 days respectively, $p < 0.001$). At the end of the first month, both groups were not different in recurrence rate at follow-up clinic.

Table 5 summarized the data of medical expenses in both groups. Only the expense categories for food and medical care significantly decreased in the ODS group, but the overall cost remained unchanged.

Discussion

This study analyzed the safety and feasibility aspects of ODS service model of herniorrhaphy at our institution. The result showed that the repair of unilateral and uncomplicated inguinal hernia with out-patient basis at Phramongkutklao Hospital was safe, pragmatic, and cost-effective. Although from Table 2 the study group were younger and had more ASA class I than the control group, the likely explanation was that the ODS choice of herniorrhaphy was limited for good risk patients who demonstrated sufficiency compliance and adequate home care at this developing phase. Our data revealed that the operation under local anesthesia and sedation was able to undertaken faster than the conventional one with high success rate of safety discharge. Post-operative complication tended to be less common, and significant faster resume to normal activity enabled ODS service to preserve or even increase the quality of surgical care in term of outcomes. It was consistent with literatures that the European Hernia Society has endorsed the grade B (weakly positive) recommendation that all potential patients with groin hernia should be considered for potential day surgery[4].

With advances in surgical and anesthetic techniques, this out-patient surgery would be adopted more frequently which would increase the rate of day surgery. The strict criteria of case selection would become less restrictive and the ODS herniorrhaphy may be considered an option for all patients who have adequate out-of-hospital care. The sedation and local anesthesia approach also seemed to be the most suitable procedure for high-risk patients who have difficulty in tolerating spinal or general anesthesia. In addition to surgical considerations, the appropriate allocating of hospital resources was another advantage. Preservation of hospitalization resources enables more balance between demand and supply for surgical services. The ODS policy is able to manage healthcare resource more efficiently and lead to shorter waiting periods for other surgical candidates[10].

Limitations

This study contains some limitations. Firstly, this was a single-center study with the small number of patients. Secondly, the surgical technique was carried out by a single group of senior surgeons, raising doubts about its generalizability. Additionally, while the recurrence of hernia is required to be monitored for at least five years, the objective of the research is to examine post-operative results in only 1-month period.

Conclusion

One-day herniorrhaphy should be considered as a standard of care in selective cases. The proxy efficiency indicator (corresponding to post-operative complication) was seen as an evidence for this surgical service. This scheme allows the hospital to aligne with national directions in order to efficiently utilize hospital beds and offer the best surgical outcome.

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