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Original Article

Cost-Analysis of Inguinal Herniorrhaphy under General Anesthesia in Same-Day Surgery

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Abstract

Background: Same-day Surgery (SDS) was the protocol that operated and discharged the patient on the same day. The benefits of SDS were decreasing crowdedness, decreasing waiting time, increasing the accessibility of medical services, and decreasing the cost of medical care. Several studies have shown herniorrhaphy under general anesthesia (GA) was safe and could be done in SDS. However, no studies evaluated the cost analysis of herniorrhaphy under GA in SDS specifically.

Objective: To compare the medical costs of herniorrhaphy under GA between SDS and traditional care from the hospital's perspective.

Methods: This study was a retrospective descriptive study. The medical chart of patients who was performed herniorrhaphy under GA at Songkhla Hospital over 5-year (2018-2022) was reviewed. The patients who had ASA class ≥ III, recurrent hernia, bilateral inguinal hernia, herniorrhaphy with an additional procedure, acute incarcerated hernia, and strangulated hernia were excluded from this study. Demographic data and direct medical costs were compared between the SDS group and the traditional group.

Results: 49 patients were recruited for this study. 25 patients in the traditional group and 24 patients in the SDS group. Two cases (8.3%) in the SDS group failed to discharge on the same day. The overall costs were significantly lower in the SDS group (6,081 Baht ± 712 vs 9,445 ± 3,499 Baht, Mean difference 3,246 Baht, $p > 0.001$). The length of stay was significantly shorter in the SDS group (0.31 ± 0.19 days vs 3.33 ± 2.13 days, Mean difference 3.11 days, $p > 0.001$). No significant difference in overall complications between both groups.

Subgroup analysis of patients without complication was shown the same result. The overall cost, total labor costs, and medication costs were still significantly lower in the SDS group. The material costs were significantly higher in the SDS group.

Conclusion: Herniorrhaphy under GA in same-day surgery had lower medical costs, shorter length of stay, and no difference in overall complications compared to traditional care.

Keywords: Cost-analysis, Same-day surgery, Herniorrhaphy, Under GA

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Introduction

Inguinal herniorrhaphy is one of the most common operations.[1] Inguinal hernia repair was developed into same-day surgery (SDS) that operated and discharged on the same day. The benefits of SDS were decreased crowding, decrease waiting time, increase the accessibility of medical services and decrease cost of medical care.[2]

SDS decreased the length of stay because the preoperative evaluation was done at the outpatient department (OPD) and postoperative observation was done at home. Compared to traditional care, the patient was admitted 1 day before surgery for preoperative evaluation and discharged the next day after surgery.

Several studies have shown herniorrhaphy under GA was safe and could be done in same-day surgery.[3] However, no studies evaluated the cost of herniorrhaphy under GA in same-day surgery specifically. This study took the hospital's perspective. The main objective of this study was to compare the medical costs of herniorrhaphy under GA between SDS and traditional care from the hospital's perspective.

Patients and Methods

This study was a retrospective descriptive study. The medical chart of patients who was performed herniorrhaphy at Songkhla Hospital over 5-year (2018-2022) was reviewed. All operations were done by one surgeon.

The inclusion criteria was the patients who had inguinal herniorrhaphy under GA. Exclusion criteria were ASA (American Society of Anesthesiologists) class ≥ III, recurrent hernia, bilateral inguinal hernia, herniorrhaphy with an additional procedure, acute incarcerated hernia, and strangulated hernia. Patients received the information and decided to participate in the traditional group or SDS group before surgery.

In the traditional group, Patients were admitted and preoperative evaluated at the ward one day before surgery. Patients were observed and discharged the next day after an operation if there were no postoperative complications. Discharge criteria consisted of a pain score < 4, no wound bleeding/hematoma, no scrotal swelling, and postoperative voiding was seen.

In the SDS group, preoperative evaluation was done at the pre-anesthetic clinic before the operative date. After surgery, patients were closely observed for 4 hours and discharged if no early postoperative complications. Discharge criteria were the same as the traditional group. Nurses telephoned the patient to evaluate pain symptoms and detected early complications at 24 hours and 72 hours after discharge.

The anesthetic technique was the same in both groups. Herniorrhaphy with the Lichtenstein technique was done in all patients by one surgeon. An oblique incision was done at the groin. Herniotomy was done, and the hernia sac was ligated using silk 2-0. Polypropylene mesh size 3 × 6 inches was placed on the inguinal floor. Mesh was fixed to the inguinal ligament and conjoint tendon using Polypropylene 2-0. The abdominal sheath was sutured using Polyglactin 2-0. The skin was closed using a skin stapler.

In both groups, patients have been prescribed home medication Acetaminophen, Ibuprofen, Tramadol, and Milk of magnesia if no contraindication and then follow-up at 2 weeks after surgery.

The demographic data, cost, operative time, length of stay, and early postoperative complications were compared between both groups.

This study took the hospital's perspective and focused on the short-term consequences. Only direct medical costs related to inpatient or same-day surgery were considered. This study did not include direct non-medical costs and indirect costs such as costs related to time use by patients and caregivers (assumed to be similar in the two surgical approaches), costs related to referral and diagnosis, meal costs, investment costs, and depreciation expense (also assumed to be similar for the two groups).

The direct medical costs were separated into operative costs, medication costs, and perioperative nursing costs. Operative costs consisted of intraoperative labor costs and material costs. Medication costs included the costs of preoperative drugs, anesthetic drugs, postoperative drugs, and home medications. Perioperative nursing costs included nursing labor costs.

The average income per month of medical personnel was calculated into labor cost per hour according to 20 working days per month and 7 working hours per day (actually 8 hours minus 1 hour of lunchtime). The labor cost of each activity was calculated using labor cost per hour multiplied by the working period.

The software SPSS, version 19 (IBM, USA) was used for statistical analysis. Categorical variables were compared using chi-square. The mean ± standard deviation (SD) was used in continuous variables. Continuous parameters were examined using independent samples T-test. Statistical significance was defined as p-value < 0.05.

Sample size was calculated according to the data from previous study.[4] 6 patients for each group were needed to achieve a power of 80% and a significance level of 5% to declare that the two groups have significant differences.

Results

49 patients were recruited for this study. 25 patients in the traditional group and 24 patients in the SDS group. All patients were male with primary inguinal hernia. Herniorrhaphy with the Lichtenstein technique under GA was performed in all patients. Average age and ASA classification were significantly lower in the SDS group (Table 1). The endotracheal tube was used in all patients except 8 patients in SDS group was used laryngeal mask airway.

The overall cost was significantly lower in the SDS group (6,081 ± 712 Baht vs 9,445 ± 3,499 Baht, Mean difference 3,246 Baht, $p > 0.001$). Total labor costs and medication costs were significantly lower in the SDS group. But material costs were significantly higher in the SDS group (Table 2).

Table 1 Demographic data

Demographic data	Traditional (n= 25)	SDS (n = 24)	*p*-value
Age, mean ± SD	60.84 ± 16.71	51.00 ± 16.29	0.04
Comorbidity, n (%)			
Diabetes	3 (12)	1 (4)	0.31
Hypertension	11 (44)	2 (8)	0.005
Dyslipidemia	5 (20)	2 (8)	0.24
Benign prostate hypertrophy	5 (20)	0 (0)	0.02
CVA	3 (12)	0 (0)	0.08
MI	1 (4)	1 (4)	0.98
Other	2 (8)	1 (4)	0.58
ASA class, n (%)			0.013
I	10 (40)	18 (75)	
II	15 (60)	6 (25)	

Table 2 Medical costs

Medical costs	Traditional	SDS	*p*-value
Labor costs, mean ± SD			
Intraoperative labor costs	3,720 ± 1,160	3,437 ± 635	0.20
Perioperative nursing costs	1,604 ± 1,085	98 ± 62	> 0.001
Total labor costs	5,392 ± 1,968	3,545 ± 641	> 0.001
Medication costs, mean ± SD	2,788 ± 1,719	726 ± 308	> 0.001
Material costs, mean ± SD	1,318 ± 266	1,753 ± 428	> 0.001
Overall costs, mean ± SD	9,445 ± 3,499	6,081 ± 712	> 0.001

The length of stay was significantly shorter in the SDS group (0.31 ± 0.19 days vs 3.33 ± 2.13 days, Mean difference 3.11 days, $p > 0.001$). No significant difference in operative time and overall complication between both groups. No patient loss followed up at 2 weeks after surgery. No readmission and early recurrent inguinal hernia in both groups.

In the SDS group, 2 cases (8.3%) failed to discharge on the same day. One patient had dyspnea after extubation and the surgeon's concern about postoperative wound complications in another patient who had a large inguinal hernia. However, all of them clinically improved and were discharged the next day (Table 3). No reoperation was seen in the SDS group.

Table 3 Postoperative outcome

Postoperative outcome	Traditional (n = 25)	SDS (n = 24)	*p*-value
Operative time (minutes), mean ± SD	58.50 ± 15.91	54.37 ± 11.33	0.38
Length of stay (day), mean ± SD	3.33 ± 2.13	0.31 ± 0.19	> 0.001
Post-operative complication, n (%)			
Hematoma	3 (12)	0 (0)	
Surgical site infection	1 (4)	0 (0)	
Severe post-op pain	1 (4)	0 (0)	
Dyspnea after extubation	0 (0)	1 (4)	
Overall complications	5 (20)	1 (4)	0.09

In the traditional group, 5 cases (20%) had postoperative complications. The postoperative hematoma was seen in 3 patients who had a large inguinal hernia. One of them reoperated for clot evacuation on postoperative day 3 and was admitted for 8 days. One patient had postoperative severe pain and was admitted for 4 days. A surgical site infection was detected at 2 weeks after surgery in one patient who was a prisoner. Incision and drainage were done and treated as an outpatient.

Subgroup analysis of patients without complication was shown in Table 4 (excluding 1 patient in the SDS group and 5 patients in the traditional group). The overall cost, total labor costs, and medication costs were still significantly lower in the SDS group. The material costs were significantly higher in the SDS group.

Table 4 Medical costs of patients without complication

Medical costs	Traditional	SDS	*p*-value
Labor costs, mean ± SD			
Intraoperative labor costs	3,641 ± 914	3,469 ± 639	0.18
Perioperative nursing costs	1,155 ± 216	90 ± 46	> 0.001
Total labor costs	4,797 ± 1,043	3,559 ± 136	> 0.001
Medication costs, mean ± SD	2,222 ± 1,066	731 ± 314	> 0.001
Material costs, mean ± SD	1,265 ± 30.5	1,774 ± 424	> 0.001
Overall costs, mean ± SD	8,283 ± 1,478	6,137 ± 671	> 0.001

Discussion

Inguinal hernia repair in same-day surgery (SDS) had benefits in decreasing crowdedness, decreasing waiting time, increasing the accessibility of medical services, and decreasing the cost of medical care. In this study, SDS had significantly lower overall costs compared to traditional care with a mean difference of 3,246 Baht.

This study had a selection bias causing a higher overall cost for the patient in the traditional group. The surgeon preferred traditional care for the patients who had high risks such as large inguinal hernia that high risk for postoperative wound complications, multiple comorbidities, high risk for anesthetic complications, underlying disease benign prostatic hyperplasia (BPH) that high risk for postoperative urinary retention. These factors caused higher average age, ASA class, length of stay, and postoperative complications.

Subgroup analysis of patients without complication was done for decreased the selection bias. However, overall costs were still lower in the SDS group

Total labor cost should be lower in the SDS group because the lower length of stay caused decreasing perioperative nursing costs. Medical costs should be lower in the SDS group because patients in the traditional group had higher comorbidity and higher average operative time. However, material costs were a little bit higher in

the SDS group because laryngeal mask airway was used in some cases in the SDS group.

The result of this study was following with a previous study, Hantanyapong N. studied about cost-effective of pediatric One Day Surgery in indirect inguinal hernia and hydrocele in 61 patients.[4] The average total costs were lower in one-day surgery cases compared to admitted cases (6,475 Baht vs 8,213 Baht, $p < 0.001$). However, further randomized-controlled trials that had a larger sample size and included all costs such as direct medical costs, direct non-medical costs, and indirect costs would be done to confirm the benefit of SDS.

Herniorrhaphy in same-day surgery was usually done under local anesthesia (LA) because safe, low complication, and cost-effective.[4-14] But many surgeons did not interest in herniorrhaphy under LA and denied operating under GA in same-day surgery due to worried about costs and complications. Even though, several studies have shown the safety and benefit of herniorrhaphy under GA in same-day surgery.[3,15-16]

This study reassured the hospital that no surgeon preferred herniorrhaphy under LA such as Songkhla Hospital to proceed the herniorrhaphy under GA in SDS.

Conclusion

Herniorrhaphy under GA in same-day surgery had lower medical costs, shorter length of stay, and no increased overall complication compared to traditional care.

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บทคัดย่อ การวิเคราะห์ค่าใช้จ่ายของการผ่าตัดไส้เลื่อนขาหนีบภายใต้การดมยาสลบแบบวันเดียวกลับ

เมธัส อรัญนารถ, พบ.
กลุ่มงานศัลยกรรม โรงพยาบาลสงขลา จังหวัดสงขลา

ความเป็นมา: การผ่าตัดแบบวันเดียวกลับ คือกระบวนการที่ทำการผ่าตัดแล้วให้กลับบ้านในวันเดียวกัน มีประโยชน์ในการลดความแออัด ลดการรอคอย เพิ่มการเข้าถึงบริการ และลดค่าใช้จ่ายทางการแพทย์ มีหลายงานวิจัยแสดงให้เห็นว่าการผ่าตัดไส้เลื่อนภายใต้การดมยาสลบมีความปลอดภัย และสามารถทำการผ่าตัดแบบวันเดียวกลับได้ อย่างไรก็ตามยังไม่มีงานวิจัยที่ศึกษาวิเคราะห์ค่าใช้จ่ายของการผ่าตัดไส้เลื่อนภายใต้การดมยาสลบแบบวันเดียวกลับอย่างเฉพาะเจาะจง

วัตถุประสงค์: เปรียบเทียบค่าใช้จ่ายทางการแพทย์โดยตรงของการผ่าตัดไส้เลื่อนภายใต้การดมยาสลบ ระหว่างการผ่าตัดแบบวันเดียวกลับกับการรักษาแบบดั้งเดิม

วิธีการศึกษา: เป็นการศึกษาแบบเก็บข้อมูลย้อนหลัง โดยทบทวนเวชระเบียนของผู้ป่วยที่ได้รับการผ่าตัดไส้เลื่อนแบบดมยาสลบ ในช่วงเวลา 5 ปี (พ.ศ. 2561-2565) ผู้ป่วยที่มี ASA class ≥ III, ไส้เลื่อนชนิดเป็นซ้ำ, มีไส้เลื่อนขาหนีบสองข้าง, การผ่าตัดไส้เลื่อนที่มีการผ่าตัดอื่นร่วมด้วย, ภาวะไส้เลื่อนติดคาฉับพลัน (Acute incarcerated hernia) และมีไส้เลื่อนร่วมกับลำไส้ขาดเลือด (Strangulated hernia) จะถูกคัดออกจากการศึกษานี้ แล้วทำการเปรียบเทียบข้อมูลพื้นฐาน และค่าใช้จ่ายทางการแพทย์โดยตรง ระหว่างกลุ่มผ่าตัดแบบวันเดียวกลับกับกลุ่มรักษาแบบดั้งเดิม

ผลการศึกษา: ผู้ป่วย 49 ราย แบ่งเป็น กลุ่มรักษาแบบดั้งเดิม 25 ราย และกลุ่มผ่าตัดแบบวันเดียวกลับ 24 ราย ค่าใช้จ่ายทางการแพทย์โดยรวมของกลุ่มผ่าตัดแบบวันเดียวกลับ มีค่าต่ำกว่าอย่างมีนัยสำคัญ (6,081 ± 712 บาท เทียบกับ 9,445 ± 3,499 บาท, ความแตกต่างเฉลี่ย 3,246 บาท, $p > 0.001$) ระยะเวลานอนโรงพยาบาลของกลุ่มผ่าตัดแบบวันเดียวกลับ มีค่าต่ำกว่าอย่างมีนัยสำคัญ (0.31 ± 0.19 วัน เทียบกับ 3.33 ± 2.13 วัน, ความแตกต่างเฉลี่ย 3.11 วัน, $p > 0.001$) โดยที่ภาวะแทรกซ้อนโดยรวมหลังผ่าตัดของทั้งสองกลุ่ม ไม่แตกต่างกันอย่างมีนัยสำคัญ

สรุปผลการศึกษา: การผ่าตัดไส้เลื่อนแบบดมยาสลบแบบวันเดียวกลับ มีค่าใช้จ่ายทางการแพทย์ต่ำกว่า ระยะเวลานอนโรงพยาบาลสั้นกว่า และไม่มีความแตกต่างของภาวะแทรกซ้อนโดยรวม เมื่อเปรียบเทียบกับการรักษาแบบดั้งเดิม