ISSN 0125-6068

The Thai Journal of SURGERY

Official Publication of the Royal College of Surgeons of Thailand
www.surgeons.or.th/ejournal

Volume 35 January-March 2014 Number 1

ORIGINAL ARTICLES

CASE REPORT

Secretariat Office :
Royal Golden Jubilee Building, 2 Soi Soonvijai, New Petchaburi Road, Huaykwang, Bangkok 10310, Thailand
Tel. +66 2716 6141-3 Fax +66 2716 6144 E-mail: frcst@surgeons.or.th www.surgeons.or.th

The THAI *Journal of* SURGERY

Official Publication of the Royal College of Surgeons of Thailand

Vol. 35 January - March 2014 No. 1

Original Article

Comparision of Clavicle Hook Plate and K-wire with Coracoclavicular Ligament Repair in Treatment of Acromioclavicular Joint Dislocation

Somboon Wutphiriya-angkul, MD

Sawangdandin Crown Prince Hospital, Sakon Naknon, Thailand

Abstract

Background and objectives: **The most effective method for the surgical treatment of acromioclavicular joint dislocation has not been established. Two commonly used techniques are clavicle hook-plate fixation and K-wire fixation with coracoclavicular ligament repair. We performed a retrospective study to compare these two treatment strategies.**

Materials and methods: **A total of 60 patients were selected for review. Each patient was treated by one of the two methods. Data including operative time, pain score, shoulder score, return to previous work within three months, return to previous activity within six months, and operative complications were collected.**

Results: **Thirty-two patients were treated with clavicle hook plate fixation, and the rest (28) were treated with K-wire fixation and coracoclavicular ligament repair. Clavicle hook-plate fixation was associated with significantly shorter operative time and lower rate of complications ($P < 0.05$). There were no significant differences in postoperative pain, shoulder score, return to previous work within three months, and return to previous activity within six months, between the two groups.**

1)to

Conclusion: **The clavicle hook-plate technique is similar in effectiveness as the K-wire fixation with coracoclavicular ligament repair in the treatment of acromioclavicular joint dislocation, but with shorter operative time and fewer complications.**

Keywords: **acromioclavicular joint dislocation, clavicle hook-plate, K-wire fixation, coracoclavicular ligament repair**

Correspondence address: *Somboon Wutphiriya-angkul, MD, Sawangdandin Crown Prince Hospital, Sakon Nakhon 47110, Thailand; E-mail: joesomboon@hotmail.com*

Introduction

The acromioclavicular joint is commonly involved in traumatic injuries that affect the shoulder. Most injuries are related to fall onto the shoulder, and to repetitive use of the shoulder such as in heavy labor and athletics[1]. While conservative treatment is recommended for Rockwood Types I and II acromioclavicular injuries and most fractures of the shaft and the medial part of the clavicle, several different surgical treatments are described for Rockwood Type III acromioclavicular joint dislocations, and the choice of operation is still controversial[2]. The reason for the instability that leads to a relative dislocation of the lateral clavicle is the involvement of the coracoclavicular ligaments. The mechanism of injury is usually direct trauma to the superior aspect of the acromion in relation to the distal end of the clavicle.

One of the more popular surgical methods for treating this injury is K-wire fixation with coracoclavicular ligament repair, but this method involves considerable risk for complications, including loss of reduction, pin migration, and skin ulceration due to pin irritation[3]. A hook plate with an extension under the acromion has been developed to provide more rigid fixation. However, a major concern is subacromial impingement or rotator cuff injury[4].

Previous studies have shown that acromioclavicluar fixation techniques are more successful than coracoclavicular fixation techniques[5]. So far there have been no reports comparing the results of clavicle hook plate and K-wire fixation with coracoclavicular ligament repair for treating acromioclavicular joint dislocation. The purpose of this study was to retrospectively compare between the two techniques in terms of clinical outcomes. Also, the functional recovery and operative complications were examined in detail.

Materials and methods

Between 2008 and 2013, 62 adults who had acromioclavicular joint dislocation were surgically treated at Sawangdandin Crown Prince Hospital. Inclusion criteria for this study were (a) Rockwood Type III dislocation; (b) acute and unilateral dislocation; (c) internal fixation with either a clavicle hook plate or K- wire with coracoclavicular ligament repair; and (d) normal shoulder function before injury. Exclusion criteria included (a) subacromial pathology; (b) concomitant injury to the ipsilateral shoulder girdle; (c) inadequate follow-up; and (d) incomplete data.

The clavicle hook plate used in this study is a pre-contoured, stainless steel, dynamic compression plate with a wider anterolateral end and a lateral extension shaped as a hook which is placed below the acromion. The holes accept 3.5 mm cortical bone screws and 4.0 mm cancellous bone screws. The anterolateral screw holes provide additional options for screw fixation the lateral metaphyseal part of the clavicle. These plates are available with 3 or 5 holes and the hook depth can vary between 12 mm and 18 mm.

In the clavicle hook-plate fixation technique, an incision was made along the distal clavicle and acromion. The pre-bended hook of the hook-plate was inserted through the incision and the plate was placed and fixed to the lateral clavicle with three cortical screws. Postoperative immobilization was achieved with an arm sling for four to six days, the shoulder range of motion (ROM) was restricted to 90° abduction and anteversion for six weeks under the instruction of a physiotherapist.

In the K-wire fixation with coracoclavicular ligament repair technique, the skin incision was approximately 6 cm in length and made along Langer's skin lines 2 to 3 cm medial to the acromioclavicular joint. The clavicle was delivered into the wound after reflecting the anterior deltoid and trapezius. Two K-wires were inserted. A C-clamp was used to pass sutures under the coracoid from a medial to lateral direction. Two drill holes were placed through the clavicle for passage of sutures. Two suture anchors were placed along the lateral clavicle margin. The sutures were used to reattach the acromioclavicular joint capsule and the delto-trapezial aponeurosis. Postoperative immobilization was as for the hook-plate technique.

Data recorded for all patients included operative time, visual analogue pain score (0, none to 10, severe) on the first postoperative day, whether the patient returned to previous work within three months, whether the patient returned to previous activities within six months, and operative complications.

The patients were evaluated on a weekly basis after surgery. The follow-up radiographic protocol consisted of standardized radiographs that included a

true glenohumeral anteroposterior view (neutral rotation, elbow by the side); these were analyzed for implant migration, acromioclavicular joint pathology (degeneration, instability), and subacromial changes (degeneration, osteolysis). At the follow-up, the shoulder scoring system of Constant and Murley[6] was applied. In this system, both subjective and objective clinical data are included, with a maximum score of 100 points. Pain (15 points), activities of daily living (20 points), range of motion of the shoulders (40 points), and muscle power (25 points) were evaluated. The Student's *t*-test, chi-square test, and Fisher's exact test were used in the comparison of outcomes between the two groups. Two-sided p-values less than 0.05 were considered statistically significant.

Results

There were 60 patients in the present study, with an average age of 28.7 years (range 16 years to 38 years). All were followed up for more than six months after discharge from the hospital. The average follow-up time was 12.8 months (range, six months to 24 months). The 60 patients were divided into two groups, based on the method of treatment. The clavicle hook-plate group included 32 patients and the K-wire with coracoclavicular ligament repair group included 28 patients. The mechanisms of injury and demographic data related to each group are shown in Table 1.

The mean operative time was 51 minutes (range, 48 to 61 minutes) for the clavicle hook plate group and 89 minutes (range, 78 to 95 minutes) for the K-wire with coracoclavicular ligament repair group; this difference was significant. The average pain scores on the first postoperative day were five for the clavicle hook plate group and six for the K-wire with coracoclavicular ligament repair group, which were not significantly different. Details of outcomes are given in Table 2.

In the clavicle hook-plate group, the mean score for the affected shoulder using the scoring system of Constant and Murley was 89 points, and the mean score for the contralateral shoulder was 93 points. In the K-wire with coracoclavicular ligament repair group, the mean score for the affected shoulder was 87 points, and for the contralateral shoulder was 92 points. There were no significant differences in the scores between the two groups (Table 3).

Complications were recorded for each group (Table 4). Five of 32 patients with clavicle hook-plate fixation had complications, whereas 11 of 28 patients with K-wire with coracoclavicular ligament repair had

Table 1 The injury mechanism, preoperative demographic data for both treatment groups

Characteristics	Clavicle hook-plate (n = 32)	K-wire with ligament repair (n = 28)	p-value
Gender (M/F)	26/6	23/5	0.929
Age (years): mean (sd)	27.8 (3.2)	29.1 (2.8)	0.785
Follow-up (months): mean (sd)	12.6 (5.3)	12.9 (6.1)	0.826
Vehicular trauma: number (%)	25 (78)	21 (75)	0.775
Injury time (days): mean (sd)	1.5 (0.4)	1.8 (0.5)	0.684

Table 2 Comparison of outcomes between the two treatment groups

Outcome	Clavicle hook-plate (n = 32)	K-wire with ligament repair (n = 28)	p-value
Operative time (min): mean (sd) [range]	51 (3) [48 min to 61 min]	89 (6) [78 min to 95 min]	< 0.001
Pain score: mean (sd) [range]	5 (1.5) [3 to 8]	6 (1.8) [4 to 9]	0.183

Table 3 Comparison of shoulder scores between the two groups

Shoulder score	Clavicle hook-plate	K-wire with ligament repair	p-value
Affected shoulder: mean (sd) [range]	89 (5) [81 to 100]	87 (6) [72 to 100]	0.487
Contralateral shoulder: mean (sd) [range]	93 (3) [89 to 100]	92 (4) [84 to 100]	0.651
Time to evaluation (months): mean (sd)	6.1 (0.8)	6.7 (1.2)	0.374

Table 4 Comparison of complications between the two treatment groups

Complication	Clavicle hook-plate	K-wire with coracoclavicular ligament repair
Infection	2	3
Loss of reduction	1	2
Malposition	1	3
Broken implant	0	1
Implant irritation	1	2
Total	**5**	**11**

complications; this difference was significant (p = 0.039). All superficial infections were diagnosed clinically at the first follow-up visit, which was seven to ten days after surgery. A one-week regimen of oral antibiotics resolved the infections.

In the clavicle hook-plate group, all but three cases (90.6%) returned to their previous work three months postoperatively. Twenty-six patients (81.3%) could do the same athletic activities six months after surgery. In the K-wire with coracoclavicular ligament repair group, 24 patients (85.7%) returned to their previous work three months postoperatively. Twenty-one patients (75%) could do the same athletic activities six months after surgery. These differences were not statistically significant (p = 0.554 and p = 0.558, respectively).

Discussion

The acromioclavicular (AC) joint is involved in 4% to 8% of joint injuries[7]. In most cases, sports injuries, and especially road traffic injuries, are the main causes of AC joint dislocation. Many different types of operative procedures have been described for treating AC joint dislocations, and even operative versus conservative treatment of Rockwood III lesions is still a topic of discussion[8-12]. Results and complication rates of the countless procedures vary[13]. There are other minimally invasive methods available using tight rope devices, without the need for a second operation to remove metalwork, but long term results for these techniques are not yet available[14]. In our series, K-wire fixation with coracoclavicular ligament repair was used to achieve stability. However, three cases had loss of reduction related to pin migration or broken wire. We think that K-wire fixation without threads has a significant risk of pin migration. In addition, during mobilisation of the shoulder, rotation of the clavicle causes migration of the K-wires. This results in not only pin migration, but also broken wires.

AC joint dislocation treated with hook-plate fixation is a relatively new method. The hook-plate design gives a more stable fixation. In the literature, most studies reported good results with few complications[15-16]. Our results were comparable to those in the literature, and only five complications occurred in our series. However, a few studies mentioned that AC joint dislocation treated with a clavicle hook-plate might develop subacromial impingement or rotator cuff injury if the hook is placed in an inappropriate position. In our series, we found no evidence of subacromial impingement or rotator cuff injury, even though the plate was inserted in the subacromial space.

In the present study, the functional shoulder scores were not significantly different between the clavicle hook-plate and K-wire with coracoclavicular ligament repair groups. However, the clavicle hook-plate group had a slightly higher tendency to return to their previous work within three months after surgery. We determined that the hook-plate gave very stable fixation, with early and wider range of motion of the affected shoulder. Patients treated with this method should be able to return to work and to previous athletic activities in a shorter time.

This study had a few limitations: (a) it was a retrospective study and not randomised, so there was selection bias; and (b) the size of the study was relatively small, thus a few comparisons lacked statistical power.

Conclusion

Both clavicle hook-plate and K-wire with coracoclavicular ligament repair for the treatment of AC joint dislocation could achieve good results. However, internal fixation with a clavicle hook-plate had more advantages, such as shorter operative time and lower rate of complications, than K-wire fixation with coracoclavicular ligament repair.

References

1. Walz L, et al. The anatomic reconstruction of acromioclavicular joint dislocations using 2 Tight Rope devices: a biomechanical study. Am J Sports Med 2008;36:2398–406.

2. Prokop A. et al. (Tossy III injuries of the acromioclavicular joint. In what circumstances is surgery still justified? Personal results and literature review) Orthopade 2003;32:432–6.
3. Kiefer H, Claes l, Burri C, et al. The stabilizing effect of various implants on the torn acromioclavicular joint. A biomechanical study. Arch Orthop Trauma Surg 1986; 106:42–6.
4. Kashii M, Inui H, Yamamoto K. Surgical treatment of distal clavicle fractures using the clavicular hook plate. Clin Orthop 2006;447:158–64.
5. Lancaster S, Horowitz M, Alonso J. Complete acromioclavicular separations. A comparison of operative methods. Clin Orthop Relat Res 1987;216:80–8.
6. Constant CR, Murley AHG. A clinical method of functional assessment of the shoulder. Clin Orthop 1987;214:160–4.
7. Rehn J, Thelen E. (Injuries of the acromioclavicular joint) Hefte Unfallheilkd. 1975;126:131–6.
8. Nuber GW, Bowen MK. Acromioclavicular joint injuries and distal clavicle fractures. J Am Acad Orthop Surg 1997;5:11–8.
9. Gstettner C. et al. Rockwood type III acromioclavicular dislocation: surgical versus conservative treatment. J Shoulder Elbow Surg 2008;17:220–5.
10. Broos P, et al. (Surgical management of complete Tossy III acromioclavicular joint dislocation with the Bosworth screw or the Wolter plate. A critical evaluation) Unfallchirurgie 1997;23:153–9.
11. Larsen E, Bjerg-Nielsen A, Christensen P. Conservative or surgical treatment of acromioclavicular dislocation. A prospective, controlled, randomized study. J Bone Joint Surg Am 1986;68:552–5.
12. Galpin RD, Hawkins RJ, Grainger RW. A comparative analysis of operative versus nonoperative treatment of grade III acromioclavicular separations. Clin Orthop Relat Res 1985;193:150–5.
13. Ejam S, Lind T, Falkenberg B. Surgical treatment of acute and chronic acromioclavicular dislocation Tossy type III and V using the hook plate. Acta Orthop Belg 2008;74:441–5.
14. Salzmann GM, et al. Arthroscopic anatomical reconstruction of the acromioclavicular joint. Acta Orthop Belg 2008; 74:397–400.
15. Kienast B, Thietje R, Queitsch C, Gille J, Schulz AP, Meiners J. Mid-term results after operative treatment of rockwood grade III-V acromioclavicular joint dislocations with an AC-hook-plate. Eur J Med Res 2011;16:52-6.
16. De Baets T, Truijen J, Driesen R, Pittevils T. The treatment of acromioclavicular joint dislocation Tossy grade III with a clavicle hook plate. Acta Orthop Belg 2004;70:515-9.

The THAI Journal of SURGERY 2014;35:6-10.
Official Publication of the Royal College of Surgeons of Thailand

Original Article

Preliminary Report of off-Pump Coronary Artery Bypass Grafting (OPCABG) at Lampang Hospital

Nuttapon Arayawudhikul MD
Boonsap Sakboon MD
Jareon Cheewinmetasiri MD
Angsu Chartirungsun MD
Benjamaporn Sripisuttrakul RN
Roungtiva Muenpa BPharm, MPharm, BCP, PhD
Cardiovascular and Thoracic Unit, Department of Surgery, Lampang Hospital, Lampang, Thailand

Abstract

Objective: **Conventional coronary artery bypass grafting (CABG) is the standard treatment for patients with coronary artery heart disease. However, its major and life threatening complications include stroke and renal dysfunction. Off-pump coronary bypass grafting (OPCABG), by avoiding cardiopulmonary bypass, may reduce these complications.**

Patients and Methods: **We retrospectively reviewed the records of 125 consecutive patients (male 59 cases, female 66 cases) who underwent elective OPCABG from April 2011 through September 2013.The mean age (sd) was 63.8 ± 8.6 years. Left main disease was present in 24.8%. Preoperative renal insufficiency (Cr > 2.5 mg/dl) was seen in 20% of cases while previous stroke was found in 2.4%. Mean Euroscore (sd) was 6.65 ± 2.9.**

Results: **Mean graft per patient (sd) was 3.4 ± 1.1. The internal mammary artery was used in 84.8% of cases. Endarterectomy was performed in 11 patients (9.1%). Total arterial grafting was performed in 20 patients (16.0%). Conversion to on-pump technique occurred in 2 cases (1.6%); 2 patients died within 30 days (1.6%); and late deaths occurred in 4 cases (3.2%). Renal dysfunction requiring dialysis occurred in 1 (0.79%), and re-exploration for bleeding occurred in 2 cases (1.6%). There were no stroke events and no sternal wound infections. The mean follow-up time (sd) was 16.4 ± 11.0 months.**

Conclusions: **Early results of OPCABG at Lampang hospital were promising, with no mortality and low morbidity.**

Keywords: **myocardial revascularization, coronary artery bypass grafting, off-pump coronary artery bypass grafting**

Introduction

The history of coronary artery bypass graft surgery (CABG) in Thailand was began in 1974, when it was first introduced by Professor Prinya Sakiyalak at Siriraj Hospital. He performed two saphenous vein graft anastomoses to left anterior descending (LAD) and right circumflex arteries (RCA). In 1975, Dr. Chalit Cheanvechai who was practicing at the Cleveland Clinic, came back temporarily to Thailand and operated on the first case of CABG at Chulalongkorn Hospital. However, the number of patients with ischemic heart disease requiring surgery was rather low. The period

Correspondence address: *Nuttapon Arayawudhikul, MD, Cardiovascular and Thoracic Unit, Department of Surgery, Lampang Hospital, 280 Paholyotin Road, Tambon Huawiang, Muang, Lampang 52000, Thailand; Telephon: +668 4606 5546; Fax: +66 5423 7400; E-mail: anuttapon@hayoo.com*

between 1994 and 2003 saw rapid development of advanced new technology; with digitized catheterization laboratories and good quality vascular stents, and the number of percutaneous coronary interventions (PCI) was increased. Newer cardiac surgical techniques such as off-pump coronary bypass grafting (OPCABG) were also introduced. During that time, CABG became well established in Thailand and eventually OPCABG was done in 17% of all CABG cases[1].

In 2011, the first National Adult Cardiac Surgical Database Report under The Society of Thoracic Surgeons of Thailand revealed that there was a relative decrease in OPCABG performed during 2006 to 2008, down to about 7% to 9%[2]. Groups performing OPCABG routinely, such as those at the Bangkok Heart Hospital, claimed that there were real benefits such as lower mortality and morbidity, less blood transfusion, less inotropic requirements, reduced myocardial injury, faster recovery, shorter hospital stay, and lower costs[3]. We have known for a while, for example, that cardiopulmonary bypass induced whole-body inflammatory response, which causes increased mortality and morbidity[4], in addition to the traumatic effects of cannulations and subsequent thromboembolism. Neurological trauma may be as high as 2.7% to 3.1%[5].

In Thailand, it was reported that in-hospital crude ratio of mortality for off-pump to that of on-pump was 0.69 (2.4% /3.5%), with average post-operative stroke incidence of 1.1% and new onset renal failure requiring dialysis occurring in 2%, which were rather low rates of occurrence. After a period of preparation, we began offering OPCABG in late 2011. The purpose of the present study was to review our early experience with OPCABG, with special reference to complications such as renal dysfunction requiring dialysis and new onset of stroke, as well as length of hospital stay and hospital mortality.

Material and Methods

From July 2011 to September 2013, our unit performed OPCABG in 125 patients, with 4 cases requiring pump-assisting techniques due to

Table 1 Preoperative patient characteristics

Characteristics	Summary (n = 125)
Age, years: mean±SD	63.8 ± 8.6
Age > 70 years: number (%)	34 (27.2)
Female: number (%)	66 (52.8)
Vessels involved: number (%)	
One-vessel disease	4 (3.3)
Two-vessel disease	7 (16.3)
Three-vessel disease	107 (93.9)
Left-main disease	31 (24.8)
CCS angina class: mean±SD	2.9 ± 0.7
NYHA class: mean±SD	2.6 ± 0.6
Previous myocardial infarction: number (%)	119 (95.2)
Ejection fraction (EF): number (%)	
EF > 50%	82 (65.6)
EF 30% to 50%	34 (27.2)
EF < 30%	9 (7.2)
Peripheral vascular disease: number (%)	4 (3.2)
Hypertension: number (%)	116 (92.8)
Chronic obstructive pulmonary disease: number (%)	19 (15.2)
Diabetes mellitus: number (%)	55 (44.0)
Dyslipidemia: number (%)	107 (85.6)
Renal dysfunction (Cr > 2.5 mg%): number (%)	25 (20.0)
Prior TIA or stroke: number (%)	3 (2.4)
Preoperative intra-aortic balloon pump: number (%)	35 (28.0)
Euroscore 2: mean ± SD	6.7 ± 2.9

SD = standard deviation; CCS = Canadian Cardiovascular Society Criteria; NYHA = New York Heart Association Classification; Cr = Creatinine; TIA =Transient Ischemic Attack

hemodynamic instability. The preoperative characteristics of patients are listed in Table 1.

Details of our standard perioperative and operative procedures were as follows: Informed consent was obtained from all patients, after a briefing about the operation and watching a demonstration video. Angiograms were reviewed again at least the day before surgery. Aspirin was usually continued to the day of surgery, while Clopidogrel was stopped at least five days prior to surgery. Anaesthesiologists visited the patient and ordered premedication treatment. A perfusionist was always present in the operating room. Central venous catheter was always placed, and electrocardiography as well as arterial pressure were monitored. Swan-Ganz catheters were not used routinely.

6) ตัดออก

After median sternotomy was made, the conduits were harvested. When finished, heparin 100 IU/kg was administered. The activated clotting time (ACT) was maintained at a level of at least 300 seconds. At the end of operation, protamine was given at a dose of 1 mg/kg to counteract the heparin effect. Patients were placed in the Trendelenberg position or turned towards the surgeon and given volume replacement, with or without inotrope support according to anaesthesiologists.

The pericardium was opened downward from innominate vein along the course of left anterior descending artery, two heavy silk sutures were placed on the left side of the pericardium one centimeter above the phrenic nerve, two deep pericardial traction sutures (LIMA-Stitch) were placed near the left inferior pulmonary vein and between it and inferior vena cava to help facilitate exposure of each segment of coronary territories. Coronary artery stabilization was accomplished by using a commercially available stabilization system, the Octopus™ (Medtronic, Minneapolis, MN). Intraluminal coronary shunts were inserted whenever possible, or 4/0 polypropylene suture occlusions in figure of 8 formation were used as proximal and distal controls to keep the operating field bloodless. CO blower was used in every case. Ventricular pacing was used in cases of bradycardia. Distal anastomoses were performed using a continuous running 7/0 monofilament suture for venous and radial grafts, while 8/0 sutures were used for internal mammary artery (IMA) to left anterior descending (LAD) artery anastomosis. Proximal anastomoses were constructed using 6/0 running sutures, after aortic side clamping.

Preoperative intra-aortic balloon pump was liberally used the night prior to surgery in patients with left main disease and severe left ventricular dysfunction. According to the principle of functional revascularization, the anterior wall was bypassed first with IMA to LAD, then the right coronary artery, and finally the obtuse marginal vessels.

All data were collected retrospectively from computerized database. Patients were followed up at two weeks after surgery, then one month, and every four months thereafter. The data were analyzed using Stata version 11 statistical software (StataCorp, TX, USA).

Results

We have performed OPCABG in 125 cases, with 2 (1.6%) of these converted to on-pump beating heart due to hemodynamic instability (large hearts and low ejection fractions). The number of grafts used varied from 1 to 7, with an average of 3.4 grafts per patient. Left internal mammary artery (LIMA) was used in 84.8% of cases. The mean intubation and operative time was 180 minutes (Table 2).

There was no operative mortality. Thirty-day hospital death occurred in two patients (a hospital mortality of 1.6%). In one patient, death occurred on postoperative day two, from refractory ventricular tachycardia and cardiac arrest in the ICU, developing into multiple organ failure. Another patient died from renal failure and multi-organ failure after endovascular repair (EVAR).

Postoperative mortality and morbidity are shown in Table 3. No stroke was observed and only two

Table 2 Intraoperative findings

Conduits:	
Left internal mammary artery (%)	84.8
Right internal mammary artery (%)	16.8
Gastroepiploic artery (%)	4.8
Radial artery (%)	13.6
Saphenous vein (%)	84.0
Total number of anastomoses	427
Anastomoses per patient: mean±SD	3.4±1.1
Operative time (minutes): mean±SD	198.8±31.3
Conversion to on-pump beating heart: number (%)	2 (1.6)
Total arterial revascularization: number (%)	20 (16.0)

Table 3 Postoperative results of off-pump coronary artery bypass

Variable	Summary
30-day mortality: number (%)	2 (1.6)
Late mortality: number (%)	4 (3.2)
Low cardiac output syndrome: number (%)	16 (13.3)
Re-operation for bleeding: number (%)	2 (1.6)
New onset atrial fibrillation: number (%)	17 (13.6)
New onset stroke: number (%)	0
Renal failure requiring dialysis: number (%)	2 (1.6)
Deep sternal wound infection: number (%)	0
Ventilator time (hours): mean±SD	13.1±4.1
Postoperative of hospital stay (days): mean±SD	6.3±4.4
Total length of hospital stay (days): mean±SD	8.9±5.1

patients required temporary hemodialysis. New postoperative atrial fibrillation was found in 13.6% of patients. The mean intubation time was 13.1 hours. Mean postoperative stay and total length of hospital stay were 6.3 days and 8.9 days respectively. Resternotomy to stop bleeding was done in 2 patients (1.6%).

All patients were followed until September 2013. The mean follow up time was 18.5 months. The Kaplan-Meier estimate of overall survival is shown in Figure 1. There were four late deaths, including two patients who died from COPD with acute exacerbation, developing into hospital-acquired pneumonia about three months after operation. A third patient died at home six months after operation without autopsy; she had poor ventricular function preoperatively and

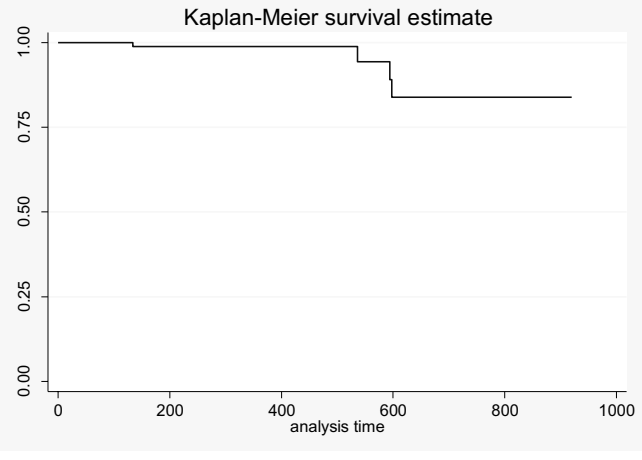

Figure 1 Kaplan-Meier estimate of overall survival in OPCABG patients in the present study

chronic aortic dissection type B. The last patient passed away at home 3 months after operation, also without autopsy. 7)three

Discussion

Conventional coronary artery bypass grafting is a standard procedure for the treatment of coronary artery heart disease in patients all over the world, including Thailand[6-8]. At Lampang Hospital, we have adopted the OPCABG technique in order to avoid the morbidity and mortality associated with cardiopulmonary bypass (CPB), which can lead to severe systemic inflammatory response especially in high-risk patients[9-12]. Numerous studies have demonstrated the safety and effectiveness of OPCABG, with favorable early outcomes. A recent meta-analysis has revealed that OPCABG may be a safer alternative to conventional CABG with respect to mortality, and it is recommended for reducing perioperative morbidity[13-15].

Details of the OPCABG procedure are constantly developing, including the introduction of innovative techniques such as cardiac stabilizers, cell-savers, and intra-coronary shunts used to create a bloodless field. Better intraoperative coordination between anesthesiologists and surgeons, along with improved cardiac and physiologic monitoring, have resulted in excellent performance of anastomoses in multi-vessel disease, without the use of CPB[16].

In the present study, perioperative morbidity was relatively low in terms of myocardial infarction (0.8%), resternotomy to stop bleeding (1.2%), and no deep sternal wound infection. Our results were similar to those found in the literature[17,18]. We had no occurrence of stroke. Almost all authors agree that patients receiving the OPCABG procedure are less likely to develop a stroke in comparison with conventional CABG, and the incidence of stroke remains low even in high-risk patients[19,20]. We routinely looked for aortic calcification usually visible from chest x-rays, and we used intraoperative transesophageal echocardiography to help evaluate atheroma or aortic calcification, and if these are seen, we used the no-touch aorta technique (total arterial revascularization).

We usually perform complete myocardial revascularization, with a mean number of distal anastomoses per patient of 3.4, which was higher than that of off-pump patients (2.8) and equivalent to that

of on-pump cases (3.5) in the series of Sabik and associates[21]. Kleisli and colleagues[22] demonstrated that the 5-year survival rate of complete revascularization was superior to that of incomplete revascularization (82.4% versus 52.6%).

Conclusion

Our early experience with OPCABG at Lampang Hospital was encouraging in all respects. We had low morbidity rates with no occurrence of stroke and no hospital mortality. However, because the present study demonstrated only the early results of treatment, midterm and long-term results have yet to be evaluated.

REFERENCES

1. Chaiseri P. Development of coronary artery bypass graft (CABG) in Thailand. Thai J Surg 2010;31:39-42.
2. The First National Adult Cardiac Surgical Database Report. The Society of Thoracic Surgeons of Thailand, 2011.
3. Ruengsakulrach P. Off-pump all arterial coronary artery bypass grafting. Bangkok Med J 2011; :32-47.
4. Kirklin JK, Westby S, Blackstone EH, Kirklin JW, Chenoweth DE, Pacifico AD. Complements and the damaging effect of cardiopulmonary bypass. J Thorac Cardiovasc Surg 1983:86:845-57
5. Engelman DT, Cohn LH, Rizzo RJ. Incidence and predictors of TIAs and strokes following coronary artery bypass grafting: report and collective review. Heart Surg Forum 1999;2:242-5.
6. Lytle BW, Loop FD, Cosgrove DM, Ratliff NB, Easley K, Taylor PC. Long-term (5-12 years) serial studies of internal mammary artery and saphenous vein coronary bypass grafts. J Thorac Cardiovasc Surg 1985;89:248-58.
7. Fitzgibbon GM, Kafka HP, Leach AJ, Keon WJ, Hooper GD, Burton JR. Coronary bypass graft fate and patient outcome: angiographic follow-up of 5,065 grafts related to survival and reoperation in 1,388 patients during 25 years. J Am Coll Cardiol 1996;28:616-26.
8. Chaiyaroj S, Viengteeravat S, Bhumarangura W, Khajarern S, Leelayana P, Puruntrapiban B. Techniques and results of off-pump coronary artery bypass grafting using homemade intracoronary shunt. J Med Assoc Thai 2006;89:
9. Larmann J, Theilmeier G. Inflammatory response to cardiac surgery: cardiopulmonary bypass versus non-cardiopulmonary bypass surgery. Best Pract Res Clin Anesthesiol 2004; 18:425-38.
10. Carrico CJ, The elusive pathophysiology of the multiple organ failure syndrome. Ann Surg 1993;218:109-10.
11. Beal AL, Cerra FB. Multiple organ failure syndrome in the 1990s. Systemic inflammatory response and organ dysfunction. JAMA 1994;271:226-33.
12. Arom KV, Flavin TF, Emery RW, Kshettry VR, Petersen RJ, Janey PA. Is low ejection fraction safe for off-pump coronary bypass operation? Ann Thorac Surg 2000;70:1021-5.
13. Immaki M, Ishida A, Shimura H, et al. Early results of off-pump coronary artery bypass. Jap J Thoracic Cardiovasc Surg 2005;53:244-50.
14. Hirose H, Amano A, Yoshida S, Takahashi A, Nakano N. Off-pump coronary artery bypass: early results. Ann Thorac Cardiovasc Surg 2000;6:110-
15. Puskas J, Cheng D, Knight J, et al. Off-pump versus conventional coronary artery bypass grafting: a meta-analysis and consensus statement from The 2004 ISMICS Consensus Conference. Innovations 2005;1:3-27.
16. Shennib H, Lee AG, Akin J. Safe and effective method of stabilization for coronary artery bypass grafting on beating heart. Ann Thorac Surg 1997;63:998-92.
17. Cheng DC, Bainbridge D, Martin JE, Novick RJ. Does off-pump coronary artery bypass reduce mortality, morbidity, and resource utilization when compared with conventional coronary artery bypass? A meta-analysis of randomized trials. Evidence-Based Perioperative Clinical Outcomes Research Group. Anesthesiology 2005;102:188-203.
18. Ascione R, Reeves BC, Rees K, Angelini GD. Effectiveness of coronary artery bypass grafting with or without cardiopulmonary bypass in overweight patients. Circulation 2002; 106:1764-70.
19. Calafiore AM, Di Mauro M, Contini M, et al. Myocardial revascularization with and without cardiopulmonary bypass in multivessel disease: impact of the strategy on early outcome. Ann Thorac Surg 2001;72:456-62.
20. Demaria RG, Carrier M, Fortier S, et al. Reduced mortality and strokes with off-pump coronary bypass grafting surgery in octogenarians. Circulation 2002;106: I5-I10.
21. Sabik JF, Gillinov AM, Blackstone EH, et al. Does off-pump coronary surgery reduce morbidity and mortality? J Thorac Cardiovasc Surg 2002;124:698-707.
22. Kleisli T, Cheng W, Jacobs MJ, et al. In the current era, complete revascularization improves survival after coronary artery bypass surgery. J Thorac Cardiovasc Surg 2005; 129:1283-91.

The THAI Journal of SURGERY 2014;35:11-13.
Official Publication of the Royal College of Surgeons of Thailand

Original Article

Types of Fistula in Ano and Postoperative Outcomes at Maharat Nakhon Ratchasima Hospital

Prinya Santichatngam, MD
Yotthapong Chumnanua, MD
Department of Surgery, Maharat Nakhon Ratchasima Hospital

Abstract

Background: **A fistula in ano is an abnormal tract or cavity communicating with the rectum or anal canal by identifiable internal opening. Recurrent rates after treatment may approach 25%.**

Objective: **To assess the relative prevalence of each type of fistula in ano, describe intraoperative findings and determine recurrence rate.**

Patients and methods: **Fistula in ano patients who underwent operation from 1 January 2009 to 31 July 2010 at Maharat Nakhon Ratchasima Hospital were prospectively studied.**

Results: **There were 120 patients (101 men, 19 women), aged between 2 to 87 years (mean age 42.4 years). Fistula-in-ano was simple in 84 patients (70%) and complex in 36 patients (30%). Among the complex fistula in ano patients were those with high transphincteric fistula in 9 cases (25%), extrasphincteric in 1 case (2.8%), anterior fistula in the female in 7 cases (19.4%), coexistent with inflammatory bowel disease in 5 cases (13.9%), with multiple simultaneous fistula in 10 cases (27.8%), and had prior sphincter surgeries or injuries in 4 cases (11.1%). Fistulotomy was done in 75 cases (62.5%), core out fistulectomy in 28 cases (23.3%), seton drainage in 16 cases (13.3%), advancement flap in 1 case (0.9%). Overall recurrence was 15% (18 cases). Recurrent rates were 41.7% (15 cases) in the complex fistula in ano group and 3.6% (3 cases) in the simple fistula in ano group, which were significantly different (P <0.05).**

Conclusion: **Simple fistula in ano was found in 70% and complex fistula in 30% of patients. Overall recurrence rate was 15%; for the complex fistula group the recurrence was 41.7%, which was significantly different from the simple fistula group (3.6%).**

Keywords: **fistula in ano, type of fistula, recurrence**

Introduction

A fistula is defined as an abnormal communication between any two epithelium-lined surfaces. A fistula in ano is an abnormal tract or cavity from the skin communicating with the rectum or anal canal by identifiable internal opening. Approximately one-third had undergone drainage of anorectal abscesses. In a series of 170 patients without previous fistulas who were followed for an average of 9 months after abscess drainage, a fistula occurred in 37% and recurrent abscess was reported in an additional 10%[1].

Fistula in ano does not heal spontaneously due to two main reasons. Firstly, fecal particles can enter the primary opening causing infection. Secondly, the intersphincteric fistula tract is compressed between internal and external anal sphincter, thus creating intermittent closed septic foci and persistent sepsis[2]. Recurrence rates may reach 25%. Recurrence is usually

Correspondence address: *Prinya Santichatngam, MD, Department of Surgery, Maharat Nakhon Ratchasima Hospital, 49 Elephant Road, Amphur Muang, Nakhon Ratchasima 3000, Thailand; Telephone/Fax: +66 4423 5463; E-mail: surgery_korat@hotmail.com*

due to infection that has gone undetected and untreated[3].

Surgeons have used inspection and digital examination in the initial assessment of a fistula prior to examination with induction of anesthesia. However, digital examination may fail to detect complex fistulas or may lead to incorrect classification[4,5]. The most often used anatomical classification to describe the tract of the fistula is that of Parks et al[6], which was based on the relation to the anal sphincter complex.

The objectives of the present study were to determine the relative prevalence of each type of fistula in ano, describe intraoperative findings and determine recurrence rates after treatment.

Patients and Methods

Fistula in ano patients who underwent surgical treatment from 1 January 2009 to 31 July 2010 at Maharat Nakhon Ratchasima Hospital were prospectively enrolled into the study. We collected demographic data, data on the type of fistula (complex or simple), and outcomes (cure or recur within one year). *T*-test and chi-square test with Yates' correction were used for statistical analysis.

The study was approved by the research ethics committee of the Surgical Department, Maharat Nakhon Ratchasima Hospital. Written informed consent was obtained from each patient.

Results

There were 120 patients (101 men, 19 women), (Table 1) aged between 2 to 87 years (mean, 42.4 years), included in the present study. Fistula-in-ano was of simple type in 84 patients (70%) and complex in 36 patients (30%). Among complex fistula in ano, high transphincteric fistula was seen in 9 cases (25%), extrasphincteric in 1 case (2.8%), anterior fistula in the female in 7 cases (19.4%), fistula coexistent with inflammatory bowel disease in 5 cases (13.9%), multiple simultaneous fistulas in 10 cases (27.8%), and fistula with prior sphincter surgery or injury in 4 cases (11.1%). Fistulotomy was performed in 75 cases (62.5%), core out fistulectomy in 28 cases (23.3%), seton technique in 16 cases (13.3%), and advancement flap in 1 case (0.9%). Overall recurrence rate was 15% (18 cases of 120). The recurrence rate was 41.7% (15 cases) for complex fistula in ano, and 3.6% (3 cases) for simple fistula in ano. The recurrence rates were significantly different between simple and complex fistula in ano groups ($p < 0.05$) (Table 2 and 3).

Table 1 Demorgraphic data (N=120 cases)

Sex male:female (cases (%))	101(84.2%):19(15.8%)
Age (yrs) (mean (SD) (min-max))	42.4(15.75)(2-87)
Type of fistula in ano (cases (%))	
- simple	84(70%)*
- complex	36(30%)**

*Simple fistula group, most of them were intersphinceric fistula
**Complex fistula in ano
1. High transphinceric fistula 9 cases (25%)
2. Extrasphincteric fistula 1 cases (2.8%)
3. Anterior fistula in female 7 cases (19.4%)
4. Patients with coexisting inflammatory bowel disease 5 cases (13.9%)
5. Multiple simultaneous fistulas 10 cases (27.8%)
6. Patients with multiple prior sphincter surgeries or injuries 4 cases (11.1%)

Table 2 Type of procedure

Procedure	Cases (%)
Fistulotomy	75 (62.5)
Core out fistulectomy	28 (23.3)
Seton drainage	16 (13.3)
Advancement flap	1 (0.9)

Table 3 Outcome

Type of fistula	N (case)	Recurrence (case)(%)	P (95% CI of OR)	OR
Complex fistula in ano	36	15*(41.7%)	<0.001**	19.29 (4.61;93.31)
Simple fistula in ano	84	3(3.6%)		

Overall recurrence rate is 15%
*Fistula with coexisting inflammatory bowel disease 5 cases, all of them had recurrence in first year.
**Statistical significance (*P*< 0.05)

Discussion

The principles of anal fistula treatment were probably first described by Hippocrates[7]. Low fistulas generally are treated with fistulotomy or fistulectomy. High or complicated fistulas require more complex surgical care because of incontinence risk[8]. Optimal management is aimed at eradicating the fistula, preserving the anal sphincter, preventing recurrence and allowing an early return to normal activity[9,10].

In the literature, intersphincteric fistula occurs in 70% of all fistulas. For the remaining, 25% are transphincteric, 4% are suprasphincteric, and 1% is extrasphincteric[11, 12]. In our study, most simple fistulas were intersphinceric fistula (84 cases) and comprised 70% of all fistulas as well, while the remaining 30% (36 cases) were complex fistulas.

Perianal fistulas affect up to 30% of patients diagnosed with Crohn's disease[13]. Anal fistulas in Crohn's disease are often associated with recurrence, and impaired quality of life[14]. Similarly, in our study fistulas with coexisting inflammatory bowel disease (five patients) all had recurrence within the first year after surgery. Although several conservative treatments have been described in the literature to manage Crohn's fistulas, and medical therapy alone has been documented to have a closure rate up to 50%[15], fistulas in Crohn's disease are therapeutically demanding, with newer treatment techniques (fistula plug and fibrin glue) as well as conventional treatment (flap advancement and seton drainage) used for their resolution.

There is great variation in the literature regarding expected rates of recurrence after treatment for fistula in ano, ranging from 0% to 21%[16-21]. The various anatomic types of the fistula are usually associated with different rates of recurrence: none for subcutaneous, 4% to 7% for intersphincteric, and 7% to 17% for transsphincteric fistulas[20]. In our study, the overall recurrence rate was 15%, with 41.7% recurrence rate for complex fistulas and 3.6% for simple fistulas. This difference was statistically significant ($p < 0.05$).

Conclusion

Simple fistula in ano occurred in 70% of patients and complex fistula in 30% in the present study. Most of the simple fistulas were intersphinceric. Overall recurrent rate was 15%, with 41.7% recurrence rate in the complex fistula group and 3.6% in the simple fistula group.

REFERENCES

1. Abbas MA, Lemus-Rangel R, Hamadani A. Long-term outcome of endorectal advancement flap for complex anorectal fistulae. Am Surg 2008;74:921-4.
2. Rojanasakul A, Pattana-arun J, Sahakitrungruang C, Tantiphlachiva K. Total anal sphincter saving technique for fistula-in-ano; the ligation of intersphincteric fistula tract. J Med Assoc Thai 2007;90:581-6.
3. Lilius HG. Fistula-in-ano, an investigation of human foetal anal ducts and intramuscular glands and a clinical study of 150 patients. Acta Chir Scand Suppl 1969;383:7-88.
4. The Standards Practice Task Force of the American Society of Colon and Rectal Surgeons. Practice parameters for treatment of fistula-in-ano supporting documentation. Dis Colon Rectum 1996;39:1363-72.
5. Seow-Choen F, Nicholls FJ. Anal fistula. Br J Surg 1992;79:197-205.
6. Parks AG, Gordon PH, Hardcastle JD. A classification of fistula-in-ano. Br J Surg 1976;63:1-12.
7. Goldberg SM, Garcia-Aguilar J. The cutting seton. In: Phillips RKS, Lunniss PJ, editors. Anal Fistula. London: Chapman & Hall Medical; 1996. p. 95-102.
8. Gurer A, Ozlem N, Gokakin AK, Ozdogan M, Kulacoglu H, Aydin R. A novel material in seton treatment of fistula-in-ano. Am J Surg 2007;193:794-6.
9. Deeba S, Aziz O, Sains PS, Darzi A. Fistula-in-ano: advances in treatment. Am J Surg 2008;196:95-9.
10. Sileri P, Cadeddu F, D'Ugo S, et al. Surgery for fistula-in-ano in a specialist colorectal unit: a critical appraisal. BMC Gastroenterol 2011;11:111-20.
11. Abcarian H, Dodi G, Gironi J, et al. Fistula-in-ano. Int J Colorect Dis 1987;2:51-71.
12. Christensen A, Nilas L, Christiansen J. Treatment of transphincteric anal fistulas by the seton technique. Dis Colon Rectum 1986;29:454-5.
13. Chung W, Kazemi P, Ko D, et al. Anal fistula plug and fibrin glue versus conventional treatment in repair of complex anal fistulas. Am J Surg 2009;197:604-8.
14. KyAJ, Sylla P, Steinhagen R, Steingagen E, Khaitov S, Ly EK. Collagen fistula plug for the treatment of anal fistulas. Dis Colon Rectum 2008;51:838-43.
15. Mitalas LE, Gosselink MP, Oom DM, Zimmermen DD, Schouten WR. Required length of follow-up after transanal advancement flap repair of high transsphincteric fistulas. Colorectal Dis 2009;11:726-8.
16. Sygut A, Zajdel R, Kedzia-Budziewska R, Trzcinski R, Dziki A. Late results of treatment of anal fistulas. Colorectal Dis 2007;9:151-8.
17. Whiteford MH, Kilkenny J 3rd, Hyman N, et al. Practice parameters for the treatment of perianal abscess and fistula-in-ano(revised). Dis Colon Rectum 2005;48:1337-42.
18. Cox SW, Senagore AJ, Luchtefeld MA, Mazier WP. Outcome after incision and drainage with fistulotomy for ischiorectal abscess. Am Surg 1997;63:686-9.
19. Ho YH, Tan M, Leong AF, Seow-Choen F. Marsupialization of

fistulotomy wounds improves healing: a randomized controlled trial. Br J Surg 1998;85:105-7.
20. Garcia-Aguilar J, Belmonte C, Wong WD, Goldberg SM, Madoff RD. Anal fistula surgery. Factors associated with recurrence and incontinence. Dis Colon Rectum 1996;39:723-9.
21. Hammond TM, Knowles GH, Porrett T, Lunniss PJ. The Sung Seton: short and medium term results of slow fistulotomy for idiopathic anal fistulae. Colorectal Dis 2006;8:328-37.

The THAI Journal of SURGERY 2014;35:14-19.
Official Publication of the Royal College of Surgeons of Thailand

Original Article

Single-incision Plus One Port Versus Standard Multiport Laparoscopic Surgery for Rectal Cancer

Sakda Alapach, MD
Araya Khaimook, MD
Mueanthep Chomvilailuk, MD
Department of Surgery, Hatyai Hospital, Hat Yai, Songkhla, Thailand

Abstract **We reported the preliminary results of the comparison of perioperative outcomes between single-incision plus one port laparoscopic rectal resection (SILS+1) and standard multiport laparoscopic rectal resection (MPL) at Hatyai Hospital.**

Materials and Methods: **The data were retrospectively collected for patients undergoing SILS+1 (34 patients), and MPL (30 patients) at Hatyai Hospital from January 2011 to September 2013. The demographic data, operative time, hospital stay, postoperative pain, conversion to open surgery, and postoperative complications were analyzed.**

Results: **With the exception of more males in the SILS+1 group, demographic data were similar in both groups. Most of the procedures were low anterior resection in both groups (28/34 in SILS+1 and 26/30 in MPL). The operative time was longer in the MPL group ($p = 0.01$). There were no significant differences in mean estimated blood loss (282.2 mL vs. 208.0 mL), number of open conversions (1 vs. 3), mean maximum postoperative pain score (6.1 vs. 7.3), mean hospital stay (13.4 days vs. 10.9 days), number of reoperations (1 vs. 2) and complication rate (5.9% vs. 13.3%). Average length of specimen was longer in the SILS+1 group (19.7 cm vs. 16.2 cm, $p = 0.01$), which also had more advanced stage tumors ($p = 0.01$). There were no significant differences in mean tumor size (4.8 cm vs. 4.1 cm), mean distal margin (2.2 cm vs. 2.4 cm) and mean number of harvested lymph nodes (10 vs. 9) between the two groups.**

Conclusion: **Preliminary results of the present study showed that SILS+1 is safe and has similar perioperative outcomes as MPL.**

Keywords: **Single incision laparoscopic surgery, rectal cancer, colorectal surgery**

Introduction

Laparoscopic surgery is at present a standard approach for colorectal cancer[1,2]. Laparoscopic low anterior resection, even for experienced surgeons, is technically demanding and usually requires a multiport approach[3,4]. Surgeons using the single port technique (single incision laparoscopic surgery, SILS) must include additional maneuvers that can provide adequate rectum traction for low rectal dissection[5,6]. At our institute, we prefer adding one more port for

Correspondence address: *Sakda Alapach, MD, Department of Surgery, Hatyai Hospital, 182 Rattakarn Road, Hat Yai, Songkhla 90110, Thailand; Telephone +66 7427 3100; Fax: +66 7424 6600; E-mail: drman@me.com*

SILS low anterior resection. In the present study we compare perioperative outcomes of low anterior resection for rectal cancer, between SILS plus one 12 millimeter port (SILS+1) and multiport laparoscopic low rectal resection (MPL).

Materials and Methods

The present study was approved by our institution's Research Ethics Committee. All medical charts of patients who underwent laparoscopic low anterior resection between January 2011 and September 2013 were reviewed. There were 34 patients in SILS+1 group and 30 patients in MPL group. All of these patients were followed for at least three months post-operatively. Demographic data and perioperative outcomes, in terms of operative time, estimated blood loss, conversion rate, maximum post-operative pain score, perioperative complications, pathological outcomes and length of stay were compared between the two groups.

The data was analyzed with SPSS for Windows software version 15.0. Univariate comparison between categorical data was performed using chi-square or Fisher's exact test as appropriate. Comparison of quantitative data was performed using the t test or Man-Whitney U test as appropriate. A two-tailed p-value < 0.05 was considered statistically significant.

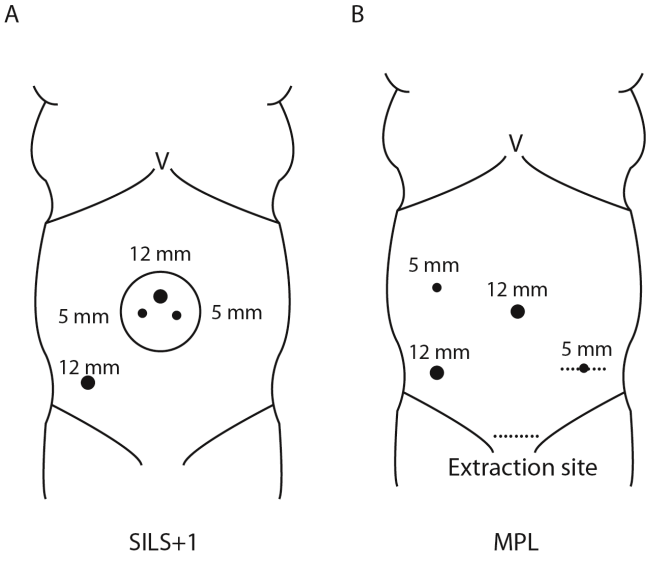

Figure 1 Locations and incisions for ports used in the Single Incision Laparoscopic Surgery Plus One (SILS+1) approach (A) and the MultiPort Laparoscopic surgery (MPL) approach (B).

In the SILS+1 group, the SILS™ port (Covidien, Inc.) was inserted through a 2.5-centimeter transumbilical incision and a 12 millimeter port was placed at right lower quadrant (Figure 1A). For the MPL group, the setup is as shown in Figure 1B. All the procedures were performed using the 30 degree laparoscope. The medial-to-lateral approach was used, starting with vascular ligation. High ligation of inferior mesenteric vessels was done in low rectal anastomosis cases, while low ligation was done for cases where the anastomosis was situated above the peritoneal reflection. The colon was dissected from its attachment and the left ureter was always identified. The rectum was mobilized in the total mesorectal excision (TME) fashion, deep down to anorectal ring. Rectal transection was performed using laparoscopic linear cutter stapler (Endo GIA™, Covidien, Inc.) through the right lower quadrant port.

In the SILS+1 group, the specimen was removed via the umbilical wound. In the MPL group, the extraction site was at the suprapubic area via a Pfannenstiel incision, or via an extension of the left 5 mm port wound. The anastomosis was performed using a circular DST Series™ EEA™ Stapler (Covidien, Inc.). A protective ostomy was created when the risk of leakage was estimated to be high. A vacuum drain was placed behind the anastomosis in low anterior resection cases and a Penrose drain was placed just above the perineal wound in abdominoperineal resection cases.

Results

Demographic data (Table 1) showed higher male to female ratio in the SILS+1 group ($p = 0.03$). There were no significant differences between the two groups regarding age (mean age, 60.3 years in SILS+1 group, vs. 62.7 years in MPL group) and body mass index (mean, 21.3 kg/m^2 in SILS+1 group, vs. 20.4 kg/m^2 in MPL group). More patients in MPL group received concurrent chemoradiation, but this difference did not reach statistical significance ($p = 0.09$).

Most of the procedures in both groups were low anterior resection (28 in SILS+1 group and 26 in MPL group). The mean operative time was significantly shorter in SILS+1 group (232.4 minutes) than in MPL group (284.5 minutes) with $p = 0.01$. There were no significant differences between the groups in terms of blood loss, maximum postoperative day one pain score,

Table 1 Comparison of demographic data between groups.

	SILS+1 group (n= 34)	MPL group (n= 30)	*p*-value
Age (yr): mean(SD)	60.3 (10.6)	62.7 (16.3)	0.49
Gender[a]			
Male	28	17	
Female	16	13	0.03
BMI (kg/m2): mean(SD)	21.3 (2.1)	20.4 (2.3)	0.10
Preoperative CRT[b]	1	5	0.09

[a]Chi-square test, [b]Fisher's exact test; SD: standard deviation; BMI: body mass index; CRT: chemoradiation

Table 2 Comparison of perioperative outcomes between groups.

	SILS+1 group (n=34)	MPL group (n=30)	*p*-value
Type of operation[b]			
Low anterior resection	25	23	0.92
Low anterior resection+ostomy	3	3	
Abdominoperineal resection	6	4	
Operative time (min): mean (SD)	232.4 (81)	284.5 (76)	0.01
Estimated blood loss (mL): mean (SD)	282.2 (221)	208.0 (219)	0.18
Open conversion[b] (%)	1 (3)	3 (10)	0.33
Additional laparoscopic port	3	NA	NA
Maximum pain score (1-10 scale): mean (SD)	6.1 (2.4)	7.3 (2.2)	0.06
Hospital stay(days): mean (SD)	13.4 (8)	10.9 (13)	0.34
Reoperation	1	2	0.48

[b]Fisher's exact test

Table 3 Comparison of pathological outcomes between groups.

	SILS+1 Group (n=34)	MPL Group (n=30)	p-value
Length of specimen (cm): mean (SD)	19.7 (5.7)	16.2 (4.7)	0.01
Tumor size (cm): mean (SD)	4.8 (1.5)	4.1 (1.9)	0.11
Distal margin (cm): mean (SD)	2.2 (1.5)	2.4 (1.5)	0.76
Number of harvested LNs: median (range)[a]	10.0 (2 to 18)	9.0 (2 to 24)	0.53
TNM stage[b] : number			
Stage I	0	6	
Stage II	12	14	
Stage III	18	8	
Stage IV	4	2	0.01

[a]Mann-Whitney U test; [b]Fisher's exact test; LNs: lymph nodes

and length of hospital stay.

According to Table 2, one case in the SILS+1 group had conversion to open surgery because of advanced stage of cancer, and three cases in the MPL groups were converted to open surgery due to advanced cancers in two cases, and ureteric injury in one case. This difference was not statistically significant (p = 0.33). Three cases in the SILS+1 group needed one more 5 mm port to facilitate dissection. Reoperations because of postoperative complications were required in one case in the SILS+1 group and two cases in the MPL group.

Regarding pathological outcomes (Table 3), all margins were free of cancer in both groups. The mean length of specimen in the SILS+1 group was longer than that in the MPL group (19.7 cm vs. 16.2 cm, $p = 0.01$). More patients had advanced TNM staging in the SILS+1 group than those in the MPL group ($p = 0.01$). Tumor size, distal margin and number of harvested lymph nodes were not statistically different between the two groups.

There were two anastomotic leakages in the SILS+1 group. One patient had protective ileostomy, and conservative treatment was successfully carried out. The other required a diverting colostomy. In the MPL group, there was one case with urinary retention, one with ureteric injury, one with anastomotic leakage, and one with colostomy gangrene. The latter two cases required reoperation. No umbilical wound complications were detected in the SILS+1 group. No statistical difference was found in overall morbidity between the two groups ($p = 0.31$). There was no mortality in both groups.

Discussion

The number of colorectal cancers in Thailand has been increasing in the last decade[7] and recent data have shown that more than half of colorectal cancers are found in rectum[8]. Laparoscopic rectal resection is now widely used for rectal cancer. Laparoscopic rectal resection with total mesorectal excision has comparable oncologic outcomes to traditional, open exploratory laparotomy[9-11]. However, the laparoscopic approach requires several incisions for port placement and specimen extraction, which may potentially result in complications for each incision[12,13]. To decrease potential wound complications, the concept of single-incision laparoscopic surgery has been introduced for colorectal operations[14].

From our own experience with laparoscopic surgery and single-incision laparoscopic surgery (SILS), we found that during rectal dissection further special instruments were usually needed[15,16]. We therefore decided to add one more 12 mm port at right lower quadrant for rectal resection. This port facilitates better traction for rectal dissection and provides more space for staple application, as well as being a good location for placing a tube drain at the end of the procedure. The mean operative time for laparoscopic rectal resection, including anterior resection and APR, was reported to be between 180 and 280 minutes[17-19]. Our data showed that the operative time was shorter (mean, 232.4 minutes) in the SILS+1 group than in the MPL group (284.5 minutes) even though there were more men and more advanced stage rectal carcinoma in the SILS+1 group. This could be because all cases of SILS+1 were operated on by one of the authors (AK) but patients in the MPL group were operated on by four other laparoscopic surgeons.

The average blood loss for laparoscopic rectal resection ranged from 136 mL to 322 mL in some series[17,20], but could be as low as 40 mL to 145 mL for the single incision approach[21,22], and 64 mL to 109.2 mL for the single-incision plus one port approach[19,22]. Our average blood loss was 228.2 mL in the SILS+1 group, which was slightly higher than the average blood loss in the MPL group, but was not significantly so. This could be partially explained by the fact that there were more advanced cancers in the SILS+1 group.

The open conversion rate for laparoscopic rectal resection ranged from 0 to 34% in the literature[9,17]. The two main reasons for conversion were bulky tumors in a narrow pelvis, and intraoperative complications requiring open correction. The conversion rates in the present study were not significantly different between the two groups. In some difficult cases in the SILS+1 group, we were able to add more ports to facilitate dissection instead of converting to open surgery.

The number of harvested lymph nodes in the present series was less than that in some other studies[20,24,25]. But no significant difference was found between both groups in terms of lymph nodes harvested. The number of lymph nodes retrieved may reflect both the quality of the TME specimen and pathological examination. Improvements in surgical technique and standardization of pathological examination should go hand in hand.

Although SILS is expected to reduce postoperative pain in laparoscopic surgery, some studies could not demonstrate this benefit[26,27]. Similarly, in the present study, we failed to show a benefit of SILS+1 above MPL in terms of pain. The hospital stay in the present study was longer than that in other reports[19,23], possibly because patients underwent preoperative evaluation and surgery during the same admission.

Anastomotic leakage is a major complication of low anterior resection. The leakage rate for laparoscopic anterior resection has been consistently less than 10%[9,24]. Our leakage rates (5.9% and 3.3%) were acceptable for both groups. Some authors have recommended diverting colostomy for anastomoses within 5 cm from the anal verge, or when the anastomosis has questionable blood supply[17,28]. Some reports mentioned a higher rate of umbilical incisional hernia in single-incision laparoscopic surgery[29,30]. Our short-term follow-up did not demonstrate incisional hernia or any complications of the umbilical wound.

Conclusions

Preliminary results of this study showed that SILS+1 is safe and not appreciably different from MPL in terms of perioperative outcomes. However, further studies are needed to definitively demonstrate the advantages of this procedure over standard multiport laparoscopic rectal resection.

REFERENCES

1. Kuhry E, Schwenk W, Gaupset R, Romild U, BonjerJ. Long-term outcome of laparoscopic surgery for colorectal cancer: a Cochrane systematic review of randomised controlled trials. Cancer Treat Rev 2008;34:498-504.
2. Liang Y, Li G, Chen P, Yu J. Laparoscopic versus open colorectal resection for cancer: a meta-analysis of results of randomized controlled trials on recurrence. Eur J SurgOncol 2008;34:1217-24.
3. Watanabe M. Laparoscopic anterior resection for rectal cancer. In: Milsom JW, BohmB, Nakajima K, editors. Laparoscopic colorectal surgery. 2nd ed. New York: Springer; 2006. p. 170-187.
4. Chadwick M, Gudgeon M. Basic laparoscopic colorectal surgery. Surgery 2011;29:21-8.
5. Fujii S, Watanabe K, Ota M, et al. Single-incision laparoscopic surgery using colon-lifting technique for colorectal cancer: a matched case-control comparison with standard multiport laparoscopic surgery in terms of short-term results and access instrument cost. Surg Endosc 2012;26:1403-11.
6. Uematsu D, Akiyama G, Narita M, Magishi A. Single-access laparoscopic low anterior resection with vertical suspension of the rectum. Dis Colon Rectum 2011;54:632-7.
7. Khuhaprema T, SrivatanakulP. Colon and rectum cancer in Thailand: an overview. Jpn J Clin Oncol 2008;38:237-43.
8. Prechawittayakul P. (Internet).Songkhla: Songklanagarind Hospital; 2013 (cited 2013,12,20). Hospital-based cancer registry. Songklanagarind Hospital annual report 2011. Available from:http://medinfo2.psu.ac.th/cancer
9. Poon JT, Law WL. Laparoscopic resection for rectal cancer: a review. Ann SurgOncol 2009;16:3038-47.
10. Fürst A, Schwandner O, Heiligensetzer A, Iesalnieks I, Agha A. Laparoscopic TME in rectal cancer-electronic supplementary: op-video. Langenbecks Arch Surg 2010;395:181-3.
11. FleshmanJW. Laparoscopic colon and rectal surgery. In: Cameron JL, Cameron AM. Current surgical therapy. 11th ed. Philadelphia: Elsevier; 2014. p. 1369-77.
12. Makino T, Milsom JW, Lee SW. Feasibility and safety of single-incision laparoscopic colectomy: a systematic review. Ann Surg 2012;255:667-76.
13. Pedraza R, Aminian A, Nieto J, Faraj C, Pickron TB, Haas EM. Single-incision laparoscopic colectomy for cancer: short-term outcomes and comparative analysis. Minim Invasive Surg 2013 doi: 10.1155/2013/283438. PMID23766897.
14. Makino T, Milsom JW, Lee SW. Single-incision laparoscopic surgeries for colorectal diseases: early experiences of a novel surgical method. Minim Invasive Surg. 2012 doi: 10.1155/2012/783074. PMID22888419.
15. Khaimook A, Borkird J. A preliminary report on laparoscopic surgery for colorectal cancer in middle-sized secondary hospitals. Songkla Med J 2008;26:291-7.
16. Khaimook A. Single-incision versus conventional multiple-incision laparoscopic cholecystectomy at Hat Yai Hospital. J Med Assoc Thai 2012;95:771-4.
17. Law WL, Lee YM, Choi HK, Seto CL, Ho JW. Laparoscopic and open anterior resection for upper and mid rectal cancer: an evaluation of outcomes. Dis Colon Rectum 2006; 49:1108-15.
18. Ng SS, Leung KL, Lee JF, et al. Laparoscopic-assisted versus open abdominoperineal resection for low rectal cancer: a prospective randomized trial. Ann Surg Oncol 2008;15:2418-25.
19. Hirano Y, Hattori M, Douden K, et al. Single-incision plus one port laparoscopic anterior resection for rectal cancer as a reduced port surgery. Scand J Surg 2012;101:283-6.
20. Ng SS, Lee JF, Yiu RY, et al. Laparoscopic-assisted versus open total mesorectal excision with anal sphincter preservation for mid and low rectal cancer: a prospective, randomized trial. Surg Endosc 2014;28:297-306.
21. Bulut O, Aslak KK, RosenstockS. Technique and short-term outcomes of single-port surgery for rectal cancer: A feasibility study of 25 patients. Scand J Surg 2013;1-8.
22. Sirikurnpiboon S, Jivapaisarnpong P. Single-access laparoscopic rectal surgery is technically feasible. Minim Invasive Surg 2013 doi:10.1155/2013/687134. PMID23577248.
23. Lim SW, Kim HJ, Kim CH, Huh JW, Kim YJ, Kim HR. Umbilical incision laparoscopic colectomy with one additional port for colorectal cancer. Tech Coloproctol 2013;17:193-9.
24. Kim SH, Park IJ, Joh YG, Hahn KY. Laparoscopic resection for rectal cancer: a prospective analysis of thirty-month follow-up outcomes in 312 patients. Surg Endosc 2006;20:1197-202.
25. Kim SH, Park IJ, Joh YG, Hahn KY. Laparoscopic resection of rectal cancer: a comparison of surgical and oncologic outcomes between extraperitoneal and intraperitoneal

disease locations. Dis Colon Rectum 2008;51:844-51.
26. Champagne BJ, Papaconstantinou HT, Parmar SS, et al. Single-incision versus standard multiport laparoscopic colectomy: a multicenter, case-controlled comparison. Ann Surg 2012; 255:66-9.
27. Fung AK, AlyEH. Systematic review of single-incision laparoscopic colonic surgery. Br J Surg 2012;99:1353-64.
28. Wu WX, Sun YM, Hua YB, ShenLZ. Laparoscopic versus conventional open resection of rectal carcinoma: A clinical comparative study. World J Gastroenterol 2004;10:1167-70.
29. Alptekin H, Yilmaz H, Acar F, Kafali ME, SahinM.Incisional hernia rate may increase after single-port cholecystectomy. J Laparoendosc Adv Surg Tech 2012;22(8):731-7.
30. Samia H, Lawrence J, Nobel T, Stein S, Champagne BJ, Delaney CP.Extraction site location and incisional hernias after laparoscopic colorectal surgery: should we be avoiding the midline? Am J Surg 2013; 205(3):264-8.

The THAI Journal of SURGERY 2014;35:20-23.
Official Publication of the Royal College of Surgeons of Thailand

Original Article

Comparison between Ligation of Intersphincteric Fistula Tract (LIFT) Technique and Conventional Fistulotomy in the Treatment of Fistula-in-Ano at Hat Yai Regional Hospital

Sakda Alapach MD*
Araya Khaimook MD*
**Department of Surgery, Hatyai Hospital, Hat Yai, Songkhla, Thailand*

Abstract **Background and objective: Treatment of fistula-in-ano remains challenging. The conventional fistulotomy has acceptable healing rate but may result in a large open wound and incontinence. The ligation of the intersphincteric fistula tract (LIFT), a new sphincter-saving technique, was devised in 2009 for the treatment of transsphincteric or horseshoe fistula-in-ano. The objective of the present study was to compare outcomes between the LIFT technique and conventional fistulotomy for the treatment of fistula-in-ano at Hatyai Hospital.**

Materials and Methods: **A retrospective analysis was performed on data collected at the Department of Surgery, Hatyai Hospital, from January 2009 to September 2013.**

Results: **There were 85 patients of whom 48 underwent the LIFT technique, and 37 underwent conventional fistulotomy. The average operative time for fistulotomy was significantly shorter at 21.4 minutes, compared with 35.1 minutes for LIFT ($p < 0.001$). The median follow up time was 41 weeks in the LIFT group, and 52 weeks in the fistulotomy group. The average healing time for LIFT was 2 weeks vs. 6 weeks for fistulotomy ($p < 0.01$), and the proportion of postoperative anal incontinence was 2.1% vs. 16.2% ($p < 0.01$) for the LIFT vs. fistulotomy, respectively. The healing rates were similar for both groups (79% and 78%, p = 0.93, for LIFT and fistulotomy groups, respectively).**

Conclusion: **Fistula-in-ano can be treated successfully by the LIFT technique, with shorter healing time, and lower incidence of postoperative anal incontinence.**

Keywords: **fistula-in-ano, ligation of intersphincteric fistula tract, fistulotomy**

Introduction

Fistula-in-ano is the chronic phase of anorectal infection[1], a common condition but a potentially complex disease process. A fistula can be encountered in 26% to 38% of all anorectal abscesses[2,3], and is characterized by chronic purulent drainage or cyclical pain associated with abscess re-accumulation followed by intermittent spontaneous decompression[4]. The majority are of cryptoglandular origin[5,6]. Fistula-in-ano is more common in men than women[7,8].

Surgery remains the only effective treatment for fistula-in-ano. The effective eradication of current and

Correspondence address: *Sakda Alapach, MD, Department of Surgery, Hatyai Hospital, 182 Rattakarn Road, Hat Yai, Songkhla 90110, Thailand; Telephone +66 7427 3100; Fax: +66 7424 6600; E-mail: drman@me.com*

recurrent septic foci, as well as the preservation of anal continence, are the goals of surgical management. No single surgical technique achieves these aims for all anal fistulas. The ligation of the intersphincteric fistula tract (LIFT) technique was recently described by Rojanasakul et al from Thailand[9]. The LIFT procedure is based on the secure closure of the internal fistula opening, and removal of infected cryptoglandular tissue through the intersphincteric approach. This procedure does not sever the anal sphincters and postoperative anal function remains intact. The healing rate from the first report was 94.4% among 18 patients, with no anal incontinence[9,10].

Since then several studies on LIFT have been published, reporting the fistula healing rate ranging from 40% to 94.4%[11]. The aim of the present study was to retrospectively compare the outcomes of treating transsphincteric or horseshoe fistula-in-ano, between the LIFT technique and conventional fistulotomy, at a tertiary care hospital.

Materials and Methods

1)Research Ethics Committee (REC)

The study protocol was approved by the Institutional Review Board (IRB) of Hatyai Hospital. Medical records of transsphincteric or horseshoe fistula-in-ano patients who underwent treatment by the LIFT technique or conventional fistulotomy from January 2009 to September 2013 were reviewed.

The collected data included demographic information, type of fistula, type of surgery, operative time, follow-up time, success of treatment, healing time, and postoperative anal incontinence. Patients were included if they: 1) were more than 18 years of age; 2) had transsphincteric or horseshoe fistula of cryptoglandular origin. Patients were not included if they had: 1) superficial fistula; 2) rectovaginal fistula; 3) fistula other than cryptoglandular in origin; 4) sinus tract abscess.

The LIFT technique was performed according to Rojanasakul et al[9] with some modifications. Preoperative rectal enema was carried out the night before the surgery. The procedure was performed with the patient in the prone jackknife position, with the buttocks taped widely apart, under spinal anesthesia. The steps of the procedure were as follows: The internal opening was identified by injection of hydrogen peroxide at the external opening. An incision was created near the internal opening parallel to the anal verge at the intersphincteric groove, then dissection was done deep into the intersphincteric plane with scissors and cautery, to identify the fistula tract. The tract was ligated with 3-0 polyglactin suture, as close to the internal sphincter as possible to leave a minimal remnant of tract connected to the internal opening, and divided. Normal saline was injected into the external opening to confirm that the correct tract has been divided. The external opening was left open to drain after curettage. The incision was closed with 3-0 polyglactin suture. All operations were performed by one of the authors (SA).

Fistulotomy was performed in same position under spinal anesthesia. After identification of internal opening, an incision was created longitudinally through the sphincteric muscle. The tract was curetted and the wound left opened, and packed with saline-soaked gauze.

Patients were discharged the following day with oral analgesic drugs and stool softeners. Before being discharged, they were shown how to clean their wounds with tap water. All patients were scheduled for follow-up examination at the first week, and every two weeks thereafter until the wound was healed. Successful wound healing for the LIFT group was defined as closure of the external fistula opening with no drainage or infection, and for the fistulotomy group, complete closure of the wound. At each visit anal continence was assessed using the Wexner Incontinence Score (WIS)[12,13]. For patients who did not show up for follow-up, telephone enquiries were made concerning the wound and incontinence status.

The student t-test was used to compare age and operative time between groups. Similarly, chi-square and Fisher's exact test were used to compare sex, type of fistula, and success of healing, and Mann-Whitney U test was used to compare follow-up time and healing time between groups. The probability of successful healing was estimated according to the Kaplan-Meier method. Statistical analyses were performed with the use of SPSS for windows version 17 (SPSS Inc., Chicago Ill). The level of statistical significance was set at $p < 0.05$.

Table 1 Patient demographics and primary outcomes, compared between groups.

	LIFT Group (n = 48)	Fistulotomy Group (n = 37)	*p*-value
Mean age, year ± SD	40.4 ± 10.9	40.0 ± 11.7	0.86[a]
Sex, number			0.05[b]
Men	36	34	
Women	12	3	
Type of fistula, number			0.66[c]
Transsphincteric	37	27	
Horseshoe	11	10	
Mean operative time, min ± SD	35.1 ± 13.2	21.4 ± 13.7	< 0.01[a]
Median follow-up time, weeks (range)	40.5 (16 to 162)	52 (12 to 160)	0.35[d]
Successful healing (%)	38 (79)	29 (78)	0.93[c]
Median healing time, weeks (range)	2 (2 to 7)	6 (3 to 9)	< 0.01[d]
Postoperative anal incontinence (%)	1 (2.1)	6 (16.2)	0.02*[b]
Median anal incontinence score (range)	2 in 1 pt	4 (2 to 6) in 6 pts	NA

[a]t-test, [b]Fisher's exact test, [c]chi-square test, [d]Mann-Whitney U test; min = minutes; pt = patient

^
2)แทรก NA = not applicable;

Results

There were 85 patients of whom 48 underwent the LIFT technique, and 37 underwent conventional fistulotomy, for the treatment of fistula-in-ano. The mean age (standard deviation) was 40.2 years (11.2 years), with a range of 22 years to 71 years. There were no significant differences in age, sex ratio, and type of fistula between both groups. The average operative time of conventional fistulotomy was significantly shorter than that of the LIFT technique (21.4 minutes and 35.1 minutes, respectively). The median follow-up times were 41 weeks and 52 weeks in LIFT and fistulotomy groups, respectively, which were not significantly different.

The LIFT technique had a healing time of 2 weeks, compared with 6 weeks for fistulotomy ($p < 0.001$), and postoperative anal incontinence rates were 2.1% and 16.2% for the LIFT and fistulotomy groups, respectively, also a significant difference ($p < 0.001$). Proportions of successful healing were 79% and 78% for the LIFT and fistulotomy groups, respectively; this was not significantly different ($p = 0.93$), as shown in Table 1.

The Kaplan-Meier plot demonstrated more rapid healing in LIFT group, as shown in Figure 1. One in 48 (2.1%) cases in the LIFT group reported abnormal anal sphincter function according to WIS, with the score of 2, compared with 6 in 37 (16.2%) cases in the fistulotomy group, in whom various degrees of postoperative anal incontinence were reported, with scores ranging from 2 to 6 ($p = 0.02$).

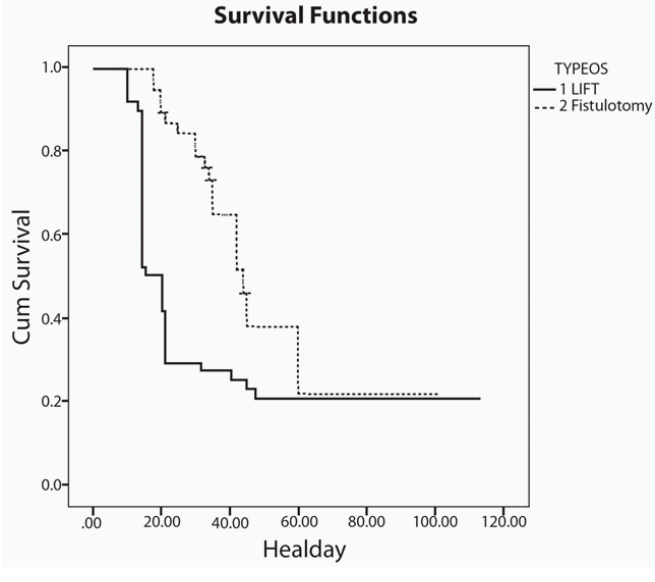

Figure 1 Kaplan-Meier plot showing rapid healing in LIFT group

Discussion

The LIFT technique is a novel approach through the intersphincteric plane for the treatment of fistula-in-ano. The present authors have adopted the LIFT technique since 2009. Proportions of successful healing in the present study were 78% and 79%, lower than the 94.4% reported by Rojanasakul et al[9]. A review of

previous publications on the LIFT technique revealed a wide range of fistula healing rates, with the lowest healing rate of 40%[11]. Previous studies were, of course, heterogeneous and the number of patients in each was small.

In the present study, the average operative time was significantly longer for the LIFT technique, due to the need for meticulous dissection. Several studies reported median operative times ranging from 10 to 68 minutes[14,15], with the average of 39 minutes[16]. However, the primary wound healing time was significantly shorter at two weeks for the LIFT technique, compared with the much longer time of six weeks for conventional fistulotomy. In the literature, the median healing time varied from 2 to 24 weeks[17,18], with an average of 8.15 weeks[19].

The advantages of the LIFT technique included: 1) a secure ligation of the fistula tract; 2) removal of infected granulation tissue by curettage, which is less time-consuming and more practical than total excision of the tract and primary repair[10]. The most serious complication of the treatment for fistula-in-ano is postoperative anal incontinence, with reported incontinence rates ranging from 0 to 40%[20]. In the present study very few patients reported anal incontinence (2.1%) among the LIFT group, significantly less than those in the conventional fistulotomy group.

Conclusion

The LIFT technique for fistula-in-ano is simple, less invasive, with satisfactory outcomes in the short term. The LIFT procedure converts the fistula-in-ano from a difficult-to-manage problem into a much more "tractable" one.

REFERENCES

1. Whiteford MH, Kilkenny J III, Hyman N, et al. Practice parameters for the treatment of perianal abscess and fistula-in-ano (revised). Dis Colon Rectum 2005;48:1337-42.
2. Ramanujam PS, Prasad ML, Abcarian H, Tan AB. Perianal abscesses and fistulas. A study of 1023 patients. Dis ColonRectum 1984;27:593-7.
3. Vasilevsky CA, Gordon PH. The incidence of recurrent abscesses or fistula-in-ano following anorectal suppuration. Dis Colon Rectum 1984;27:126-30.
4. Whiteford MH, Kilkenny III J, Hyman N, et al. AmericanSociety of Colon and Rectal Surgeons. Practice parameters for the treatment of perianal abscess and fistula-in-ano (revised). Dis Colon Rectum 2005;48:1337-42.
5. Parks AG. Pathogenesis and treatment of fistula-in-ano. Br Med J 1961;1:463-9.
6. Eisenhammer S. The internal anal sphincter and the anorectal abscess. Surg Gynecol Obstet 1956;103:501-6.
7. Sainio P. Fistula-in-ano in a defined population. Incidence and epidemiological aspects. Ann Chir Gynaecol 1984;73:219-24.
8. Abcarian H. Anorectal infection: abscess-fistula. Clin ColonRectal Surg 2011;24:14-21.
9. Rojanasakul A, Pattanaarun J, Sahakitrungruang C, Tantiphlachiva K. Total anal sphincter saving technique for fistula-in-ano; the ligation of intersphincteric fistula tract. J Med Assoc Thai 2007;90:581-6.
10. Rojanasakul A. LIFT procedure: a simplified technique for fistula-in-ano. Tech Coloproctol. 2009;13:237-40.
11. Murugesan J, Morb I, Fullhamc S, Hitosda K. Systematic review of efficacy of LIFT procedure in crpytoglandular fistula-in-ano. J Coloproctol 2014. http://dx.doi.org/10.1016/j.jcol.2014.02.008
12. Jorge JMN, Wexner SD. Etiology and management of fecal incontinence. Dis Colon Rectum 1993;36:77-97.
13. Vaizey CJ, Carapeti E, Cahill JA, Kamm MA. Prospective comparison of faecal incontinence grading systems. Gut 1999;44:77-80.
14. Mushaya C, Bartlett L, Schulze B, Ho Y-H. Ligation of intersphincteric fistula tract compared with advancement flap for complex anorectal fistulas requiring initial seton drainage. Am J Surg 2012;204:283-9.
15. Shanwani A, Nor AM, Amri N. Ligation of the intersphincteric fistula tract (LIFT): a sphincter-saving technique for fistula-in-ano. Dis Colon Rectum 2010;53:39-42.
16. Alasari S, Kim NK. Overview of anal fistula and systematic review of ligation of the intersphincteric fistula tract (LIFT). Tech Coloproctol 2014;18:13-22.
17. Cui J, Wang Z, Zheng Y, Han J, Yang X. (Ligation of the intersphincteric fistula tract plus bioprosthetic anal fistula plug (LIFT-plug) in the treatment of transsphincteric perianal fistula). Zhonghua Wei Chang Wai Ke Za Zhi 2012;15:1232-5.
18. Aboulian A, Kaji AH, Kumar RR. Early result of ligation of the intersphincteric fistula tract for fistula-in-ano. Dis Colon Rectum 2011;54:289-92.
19. Alasari S, Kim NK. Overview of anal fistula and systematic review of ligation of the intersphincteric fistula tract (LIFT). Tech Coloproctol 2014;18:13-22.
20. Rizzo JA, Naig AL, Johnson EK. Anorectal abscess and fistula-in-ano: evidence-based management. Surg Clin North Am 2010;90:45-68.

The THAI Journal of SURGERY 2014;35:24-27.
Official Publication of the Royal College of Surgeons of Thailand

Case Report

Leiomyoma of Testis: A Case Report and Literature Review

Bunchong Seubsang, MD
Division of Urology, Warinchumrab Community Hospital, Ubolratchathani , Thailand

Abstract ***Leiomyoma* is a benign smooth muscle neoplasm that is very rarely (0.1%) premalignant. They can occur in any organ, but they are infrequently found in the genitourinary tract. In the genitourinary tract, the renal capsule is the most common site of involvement. Intrascrotal leiomyomas are infrequently seen. Leiomyoma of testis is extremely rare. Herein, we report a case of leiomyoma of the testis.**

Keywords: **testis, leiomyoma**

Introduction

Leiomyoma is a benign neoplasm that may arise from any structure or organ containing smooth muscles. In the genitourinary tract, the renal capsule capsule is most commonly involved[1], but this tumor has also been reported in the epididymis , spermatic cord, and tunica albuginea. Intratesticular leiomyoma is extremely rare. Nino-Murcia and Kosek reported the first case of an intratesticular leiomyoma in 1989[2]. Herein, we report a case of leiomyoma of the testis.

Case Report

A 43-year old male patient came to our hospital with chief complaint of right-sided testicular swelling for 17 years, gradually increasing in size with mild right lower abdominal pain 1 year prior to admission. On physical examination, we found an enlarged, hard consistency mass at the lower part of the right testis with mild tenderness at the right epididymis. The right spermatic cord was unremarkable. The left testis, epididymis, and spermatic cord were normal. Scrotal ultrasonography showed a normal right testis located at the upper part of the scrotum with minimal distorted orientation, measuring 3.2 × 1.9 × 2.8 cm in size. The right epididymis was not visualized. There was a well-defined heterogeneous mass with internal vascularity in right scrotum, possibly arising from epididymis or spermatic cord. The left testis was also normal, measuring 2.0×2.7×2.3 cm in size. The left epididymal head was unremarkable. Minimal free fluid was seen in both scrotal sacs (Figure 1).

A tumor marker study revealed that α-fetoprotein (AFP), level was 0.8 IU/mL and the β-human chorionic gonadotropin (β-HCG) level was 0.10 mIU/mL, both of which were within normal limits. The patient underwent a right inguinal exploration and a radical orchiectomy. Operative findings were that of a well demarcated mass measuring 5.0 × 3.5 × 3.0 cm at the peritesticular capsule. The cut surface of the mass

Correspondence address: *Bunchong Seubsang, MD, Division of Urology, Warinchumrab Community Hospital, Ubolratchathani 34190, Thailand; Telephone: +66 4526 7259; Fax +66 4526 7258; E-mail: bseubsang5599@gmail.com*

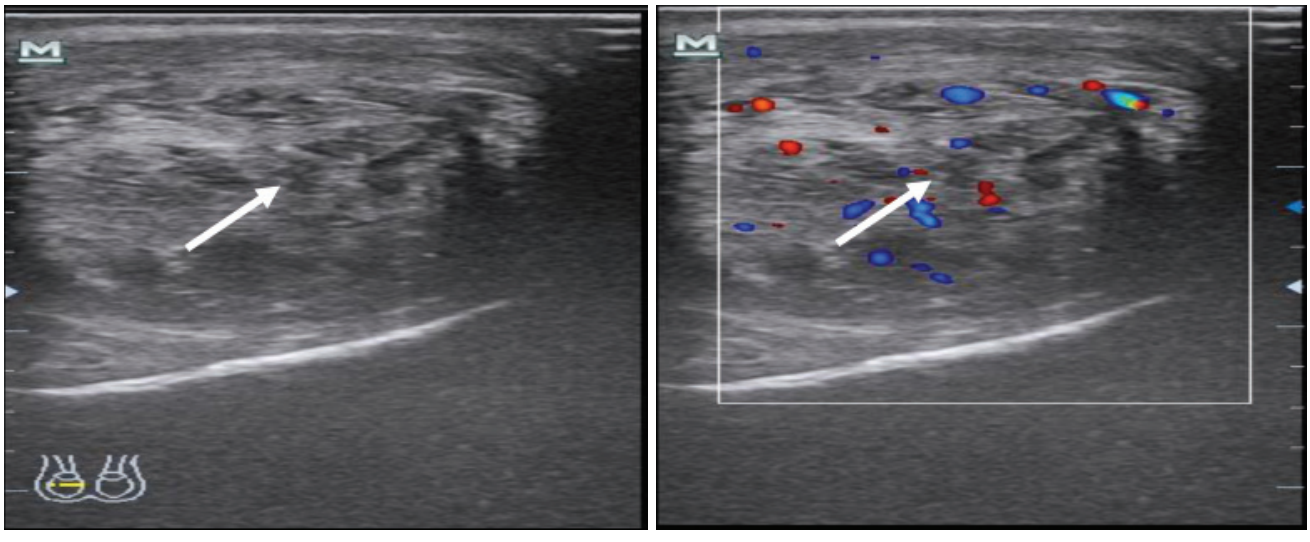

Figure 1 Ultrasound of the right testis showing a well-defined heterogeneous mass with internal vascularity in the right scrotum (white arrows).

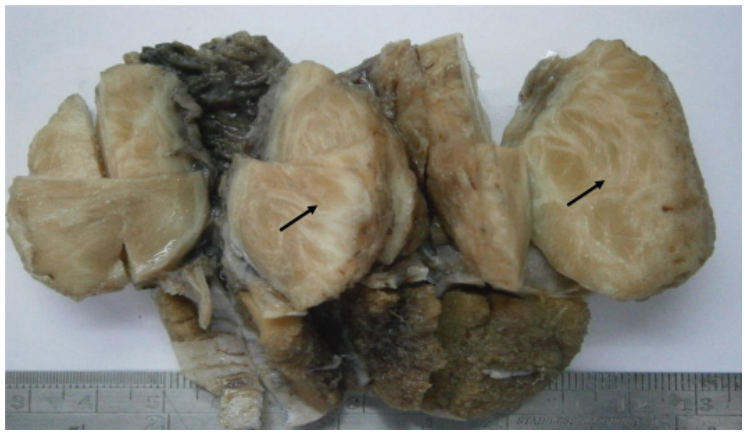

Figure 2 Gross examination of the right testis showing a well demarcated mass at the peritesticular capsule and the gray white, whorl-like appearance of the cut surface (black arrows). The testicular parenchyma, tunica albuginea, and epididymis were normal.

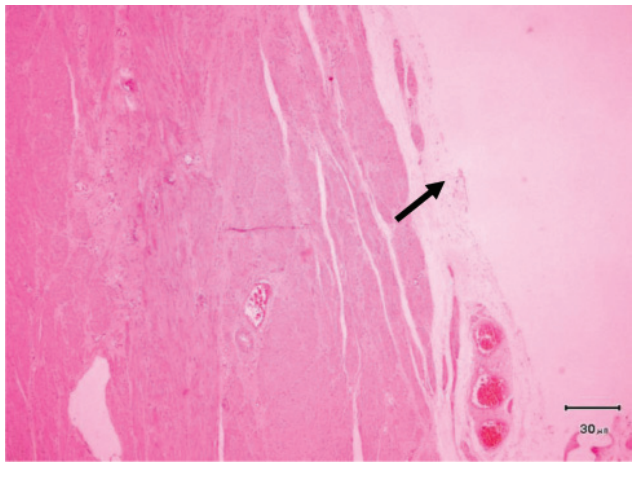

Figure 3 Histological examination of the right intratesticular leiomyoma showing an encapsulated tumor comprising of interlacing fasicles of smooth muscle cells without significant nuclear atypia (black arrows).

showed gray-white, whorl-like appearance. The tunica albuginea was intact and smooth. The rest of the testicular parenchyma was unremarkable. The right epididymis could be identified (Figure 2). Histological examination showed encapsulated tumor comprising interlacing fascicles of smooth muscle cells without significant nuclear atypia. Neither necrosis nor mitotic figures were found. The right epididymis was not remarkable. The spermatic cord margin was free from the tumor (Figure 3). The pathological diagnosis was leiomyoma of the right testis. The postoperative course was uneventful.

Discussion

Albert and Mininberg reported the first case of testis-associated leiomyoma in 1972[3]. We reviewed the literature and found 19 cases previously reported. Chen et al. in 2007 reviewed the literature and found 17 cases, and also proposed using "testis-associated leiomyoma" to describe these lesions. They found that 10 of 17 cases did not involve the testicular parenchyma, while in 7 cases the tumor arose within and displaced part of testicular parenchyma. The mean age (standard deviation) of patients was 52.1 (18.9) years (range, 10-85 years). Six patients (35%) had left testicular involvement, eight patients (47%) had a right side mass, and three patients (18%) had bilateral tumors. In 16 of 17 cases, patients reported slowly growing, painless intrascrotal masses, and only 1 patient suffered from a tender mass due to acute torsion[4].

In 2011 Kullolli et al. reported the 18th case of leiomyoma of testis, found on the left side[5], and in 2012 Bremmer et al. reported the 19th case of leiomyoma of tunica albuginea on the right side of the scrotal sac[6].

We report a case of intratesticular leiomyoma, involving the lower part of the right testis. The duration of symptoms was 17 years. The tumor gradually increased in size, was only mildly tender, and had a hard consistency. Sonography is the imaging modality of choice for evaluating intrascrotal pathology. The sonographic features of leiomyomas included solid hypoechoic or heterogeneous masses that may or may not contain shadowing calcification[7]. In our patient ultrasonography showed a well-defined heterogeneous mass with internal vascularity.

The origin of the intratesticular leiomyoma is controversial, but more recently it is thought to arise from the contractile cells in the tunica propia of seminiferous tubules[8]. Histologically, the characteristic features include the presence of elongated spindle shaped cells with eosinophilic cytoplasm. The nuclei can be normomorphic or oval in shape and usually seen at the center of the cell. The cells tend to be packed and overlapping and can be arranged in intertwining fasciculi[9]. In our patient, histological examination showed an encapsulated tumor comprising interlacing fascicles of smooth muscle cells without significant nuclear atypia. Neither necrosis nor mitotic figures were found.

Chiong et al. in 2004 suggested that inguinal exploration of suspicious scrotal masses is mandatory[10]. They recommend routine intraoperative frozen section biopsy as it may allow for testicular preservation. In our case we undertook a right inguinal exploration and a radical orchiectomy, because we could not distinguish clinically between benign lesions and the more common testicular cancer, and frozen section biopsy was not available at our institute. However serum tumor markers including AFP and β-HCG might help in distinguishing between benign and malignant testicular mass. In our case, AFP and β-HCG levels were within normal limits.

Conclusions

Testicular leiomyomas are a benign and very rare neoplasm. This tumor is generally slow-growing and asymptomatic. Serum tumor marker levels including AFP and β-HCG are usually within normal limits. Ultrasonography is the imaging modality of choice for evaluating intrascrotal pathology. Intrascrotal leiomyoma is indistinguishable from a malignant testicular neoplasm, but is similar in appearance to other leiomyomas occurring elsewhere in the body. Despite its benign nature, radical orchiectomy remains the treatment of choice, because the lesion cannot be distinguished clinically from the more common testicular cancers. A preoperative needle biopsy or intraoperative frozen section biopsy may allow for testicular preservation.

REFERENCES

1. Belis JA, Post GJ, Rochman SC, Milam DF. Genitourinary leiomyomas. Urology 1979;13:424-9.
2. Nino-Murcia M, Kosek J. Leiomyoma of the testis: sonographic and pathologic findings. Can Assoc Radio J 1989;40:178-9.

3. Albert PS, Mininberg DT. Leiomyoma of tunica albuginea. J Urol 1972;107:869-71.
4. Chen YC, Li MH, Tsai WM. Clinical characteristics of testis-associated leiomyoma: a case report and literature review. J Taiwan Urological Assoc 2007;18:157-60.
5. Kullolli VS, Kullolli S, Pawar S, Gautam D. Leiomyoma of testis - a case report. Indian J Surg 2011;73:233-5.
6. Bremmer F, Kessel FJ, Behnes CL, Trojan L, Heinrich E. Leiomyoma of the tunica albuginea, a case report of a rare tumor of the testis and review of the literature. Diagn Pathol 2012;7:140.
7. Mak CW, Tzeng WS, Chou CK, Chen CY, Chang JM, Tzeng CC. Leiomyma arising from tunica albuginea of the testis : sonographic findings. J Clin Ultrasound 2004;32:309-11.
8. Takahashi G, Takahashi H, Shinagana T. Intratesticular leiomyoma: A case report. Hinyokika Kiyo 1991;37:1551-3.
9. Thomas J, Rifkin M, Nazeer T. Intratesticular leiomyoma of the body of the testis. J Ultrasound Med 1998;17:785-7.
10. Chiong E, Tan KB, Siew E, Rajwanshi A, See H, Esuvaranathan K. Uncomnon benign intrascrotal tumors. Ann Acad Med Singapore 2004;33:351-5.