



A Comparative Study between Fistulectomy and Fistulotomy with Marsupialization In Management of Simple Anal Fistula

Prof. Dr. Ahmed Mohamed Khalifa Nafei, Prof. Dr. Hanna Habib Hanna, Dr. Mohammed Abd Almegeed Alsayed, and Badr Eldeen Mamdouh Badr Eldeen Hegazy

General and Colorectal Surgery, Faculty of Medicine, Ain Shams University, Cairo, Egypt
drbadrhegazy2019@gmail.com

Abstract: Anal fistula is a common disease that has long challenged surgeons' skills. Perianal fistula, if not treated properly will result in one of two terrible complications, recurrence or incontinence. Despite many preoperative investigations that can help to identify the correct anatomy of the fistula, one might face difficult or unexpected intraoperative findings that require wise decisions. Appropriate decisions in such circumstances have a significant impact on the outcome of surgery and the patient's quality of life. The present study is a retrospective clinical trial study including twenty five (25) patients who presented with simple perianal fistula to surgical outpatient clinic at Ain Shams University Hospitals in Egypt. The patients were divided in to two groups: A. Group A: patients who underwent fistulectomy. B. Group B: patients who underwent fistulotomy with marsupialization. Fistulotomy with marsupialization is a simple, easy, and effective method for the treatment of simple perianal fistula, as it has shorter operating time with less postoperative pain and less time needed for wound healing than fistulectomy with the same incidence of postoperative complications, recurrence, and incontinence as fistulectomy.

[Prof. Dr. Ahmed Mohamed Khalifa Nafei, Prof. Dr. Hanna Habib Hanna, Dr. Mohammed Abd Almegeed Alsayed, and Badr Eldeen Mamdouh Badr Eldeen Hegazy. **A Comparative Study between Fistulectomy and Fistulotomy with Marsupialization In Management of Simple Anal Fistula.** *Nat Sci* 2019;17(11):173-180]. ISSN 1545-0740 (print); ISSN 2375-7167 (online). <http://www.sciencepub.net/nature>. 21. doi: [10.7537/marsnsj171119.21](https://doi.org/10.7537/marsnsj171119.21).

Keywords: Comparative; Study; Fistulectomy; Fistulotomy; Marsupialization; Management

1. Introduction

History documents a wide range of treatments that have been undertaken over the years in an attempt to treat this problem, with no one particular treatment accepted as a gold standard. The documented history of fistula management with cutting setons initially started with Hippocrates, who inserted horsehair with lint into the fistula and, which was periodically tightened (**Francis Adams, 1849**).

The Middle Eastern physician **Albucasis (936–1013 AD)** as well as the medieval physician **John Arden (1307–1392 AD)** practised a variety of methods to treat fistulae. Patience was the cornerstone of their treatment; however, they found that their patients often wanted a quick fix to their ailments. The Treaties of Fistulae texts written by Arden describe seton use for complex fistulae. Today the material may be different but the principle is the same (**Arden, 1910**).

In 1835, **Fredrick Salmon** opened 'The Infirmary for the Relief of the Poor Afflicted with Fistula and Other Diseases of the Rectum' following the successful treatment of Charles Dickens. The fistula became popular and by 1854 the infirmary site was relocated and re-named 'St Mark's Hospital for

Fistula and other diseases of the Rectum (**Dukes C, Frederick Salmon, 1959**).

Sir Lockhart-Mummery summarised the difficulties that surgeons encountered in treating anal fistulae when he said 'Probably, more surgical reputations have been damaged by the unsuccessful treatment of fistula than by excision of the rectum or gastroenterostomy' and later went on to state 'The bad results of laparotomy are generally buried with flowers, while fistulae go about the world exhibiting the unsuccessful results of the treatment (**Lockhart-Mummery, 1929**).

Anal fistula is a common disease that has long challenged surgeons skills. Perianal fistula, if not treated properly will result in one of two terrible complications, recurrence or incontinence. Despite many preoperative investigations that can help to identify the correct anatomy of the fistula, one might face difficult or unexpected intraoperative findings that require wise decisions. Appropriate decisions in such circumstances have a significant impact on the outcome of surgery and the patient's quality of life.

The ideal surgical treatment for anal fistula should eradicate sepsis and promote healing of the tract, whilst preserving the sphincters and the mechanism

of continence. For the simple and most distal fistulae, conventional surgical treatment such as lay-open of the fistula tract as a complete transection of the tissue between the fistula tract and anoderm is very effective with a success rate of up to 100%. Although reported incontinence rates following fistula surgery is very variable and is influenced by many factors, incontinence rate after laying open of intersphincteric and distal fistulae seems to be under 10% (**Limura and Giordano, 2015**).

Generally there is a tendency of the female sphincter function complex to be weaker and shorter than that in male, and the external sphincter to be at its thinnest at 12 o'clock, and of the internal sphincter to be at its thickest at 9 o'clock, it was seen in all age groups except in the ≥ 60 years group, where the internal sphincter was not at its thickest at 9 o'clock but at 3 o'clock (**Starck et al., 2005**).

Goodsall's rule states that the external opening of a fistula situated behind the transverse anal line will open into the anal canal in the midline posteriorly. An anterior opening is usually associated with a radial tract. The exception to the rule is anterior fistulae lying more than 3cm from the anus, which may have a curved track (similar to posterior fistulae). This rule is not without many exceptions. The internal opening will decide the extent of sphincter division during fistulotomy (**Torkzad, 2010**).

The risk of postoperative incontinence was shown to be greater for females than for males. It is commonly believed that women are more prone than men to incontinence after surgical treatment for the fistula because of the smaller sphincter mechanism that may also be impaired by vaginal childbirth (**Takayuki, 2007**).

Aim of the Work

This work aims at studying the simple anal fistula management as a comparative study between fistulectomy and fistulotomy with marsupialization as regards:

- Post operative pain.
- Post operative infection rate and healing time.
- Rate of post operative recurrence.
- Post operative incontinence..

2. Patients and Methods

The study is a retrospective clinical trial study February 2017 to May 2019 including twenty five (25) patients who presented with simple perianal fistula were underwent either fistulectomy or fistulotomy with marsupialization.

Operations had been performed in the department of surgery in El Demerdash Hospitals.

Inclusion Criteria:

Patients (18-65 age groups) with informed consent.

Patients fit for surgery.

Low transsphincteric fistula involving less than the lower one third of the anal sphincter.

Intersphincteric fistula and subcutaneous fistula with presence of both external and internal openings.

Exclusion Criteria:

ASA (The American Society of Anesthesiologists Physical Status classification system) unfit patients (class III or IV).

Age: patients above 65 and below 18 years old.

Patients with anal incontinence.

Patients with malignant fistula.

Patients with inflammatory bowel syndrome such as ulcerative colitis and Crohn's Disease.

Recurrent fistulae.

High fistulae.

All patients were subjected to the following:

Preoperative assessment

Preoperative assessment including history taking and through physical examination was performed. Laboratory investigations including (complete blood picture, prothrombin time, liver function tests, kidney function tests, blood glucose) were routinely done to all patients.

Preoperative work-up including electrocardiography (ECG) was performed to all patients. Specialty consultation was performed when indicated. Prophylactic intravenous third generation was administered at the induction of anesthesia.

Detailed history will be taken from patients to identify the cause of fistula and presence of fecal incontinence as regard its onset, history of ano rectal abscess, previous surgery or chronic illness.

Physical examination:

Perineal inspection and palpation to assess external and internal openings, any discharge, piles or fissures.

Digital rectal examination (DRE) to assess the location and the size of the tract, the tone, piles and any masses if found.

Routine preoperative blood tests (complete blood picture, prothrombin time (PT), kidney, liver function tests: as ALT & AST and INR) and electrocardiography (ECG).

Patient preparation:

All the patients signed the informed consent.

Control of any coexisting medical disease.

Treatment of any suppuration.

Intraoperative assessment and technique:

The patients were divided in to two groups:

1. Group A: patients who underwent fistulectomy.

2. Group B: patients who underwent fistulotomy with marsupialization.

The patients were operated on under regional or general anaesthesia. Under anesthesia, anorectal

examination and proctoscopy were performed to verify the findings of the clinical examination.

A dye study of the fistula tract was performed by placing moist gauze in the anal canal and injecting about 2 ml of methylene blue through the external opening. Staining of the gauze piece denoted patency of the fistula tract. A probe was gently passed into the fistulous tract through the external opening.

Surgical modalities:

A: In the fistulectomy, a keyhole skin incision was made over the fistulous tract and encircled the external opening. The incision was deepened through the subcutaneous tissue, and the tract was removed from surrounding tissue, Figure (1).



Figure (1): Fistulectomy.



Figure (2): Fistulotomy.

B: In the fistulotomy with marsupialization, the fistula tract was laid open over the probe placed in the tract. After the fistula tract had been laid open, the

tract was curetted and examined for secondary extensions. Wound edges were sutured with the edge of fistula tract by using interrupted 3-0 chromic catgut sutures, Figure (2).

Postoperative care:

1. Patients in both groups were administered ciprofloxacin and metronidazole as perioperative antibiotics for a total duration of three days. Diclofenac sodium (50 mg twice a day) was prescribed as an analgesic for a total duration of 3 days. The patients were discharged within three days unless there are no expected complications as bleeding or other unexpected complications. The patients were advised regarding oral medication, maintenance of local hygiene, warm bath after defecation, dressings, and regular follow-up.

2. The initial postoperative assessment was undertaken at twenty four hours following surgery. The severity of postoperative pain was assessed on a scale of 0 to 10 with help of the visual analogue scale (VAS). Patients were asked about anal incontinence. Development of incontinence was assessed using the three-point Lickert scale (0, never; 1, sometimes; 2, always) according to inability to distinguish between gas and stool, difficulty in holding gas and soiling of undergarments at one month and three months visits.

3. The routine follow up: patients were informed about regular outpatient visits after one week, two weeks, one month, three months, six months and nine months to assess wound healing, recurrence, inflammation and incontinence.

The comparison between the 2 groups was in the following criteria:

Intraoperative: operative time, intraoperative findings, intraoperative complications.

Postoperative:

Postoperative pain (the need for analgesia) wound infection, general complications of surgery, postoperative hospital stay, the fecal incontinence and recurrence.

Statistical Analysis

Analysis of data was performed with a personal computer using SPSS Prism.

Statistical presentation and analysis of the present study was conducted, using the mean, standard deviation, chi-square and **t-test** by SPSS V.20.

3. Results

The present study is a retrospective clinical trial study including twenty five (25) patients who presented with simple perianal fistula. The patients were divided into two groups:

Group A: Patients who underwent fistulectomy.

Group B: Patients who underwent fistulotomy with marsupialization.

Patient's characteristics: with median age 27.87 years in Group A and 28.92 years in Group B and mean BMI 35.52 kg/m² in Group A and 34.24 kg/m² in Group B as shown in table (1).

As shown in table (1). The comparison between both groups as regard to age, Body Mass Index (BMI), diabetes mellitus (DM) and Sex was not significant as (p>0.05).

Table (1): Demographic data of both Fistulectomy and Fistulotomy with marsupialization

Demographic data		Fistulectomy (A)	Fistulotomy with marsupialization (B)	P
		13 cases 7 cases (Transsphincteric fistula) 6 cases (Intersphincteric fistula)	12 cases 4 cases (Transsphincteric fistula) 8 cases (Intersphincteric fistula)	
Age		27.87±5.47	28.92±6.27	0.659*
BMI		35.52±11.24	34.24±10.33	0.770*
DM		3 (23.07%)	4 (33.33%)	0.568**
Sex	Males	7 (53.85%)	5 (41.67%)	0.542**
	Females	6 (46.15%)	7 (58.33%)	

*Student t-test **Chi- square test

*t and X²-value was significant at 0.05significance level of Pvalue

Operative time:

The operative time was significantly longer in the group A with mean time 30.7 minutes than in group B with mean time 20.22, P value was 0.019 (Table 2)

As presented in table (2). Patient based Comparison between Fistulectomy and Fistulotomy with marsupialization groups with regard to time of operation was significant as (p<0.05).

Table (2): Comparison between the two studied groups according to Time of operation (min)

	Fistulectomy (A)	Fistulotomy with marsupialization (B)
Range	27-42	17-26
Mean±SD	30.7±11.94	20.22±8.46
t-value	2.51	
p-value	0.019*	

*t-value was significant at 0.05significance level of P value.

Postoperative hospital stay:

The postoperative hospital stay was significantly longer in group A with mean time 2.4 days than in group B with mean time 1.7 days, P value was 0.021. See table (3) & figure (21).

Data presented in table (3) and illustrated in Fig (15) showed that there was a significant difference between the studied groups concerning postoperative hospital stays as (p<0.05)

Table (3): Comparison between the two studied groups according to postoperative hospital stays (days)

	Fistulectomy (A)	Fistulotomy with marsupialization (B)
Range	2-6	2-5
Mean±SD	2.4±0.8	1.7±0.59
t-value	2.47	
p-value	0.021*	

*t-value was significant at 0.05significance level of P value.

Postoperative pain scores in VAS:

The postoperative pain was significantly higher in group A with mean pain 8.2 at 6 hours, 6.9 at 24 hours and 5.12 at discharge than group B with mean pain 6.15 at 6 hours, 5.34 at 24 hours and 4.03 at discharge time, P value was 0.032, 0.016, 0.036 (6

hours, 12 hours and at discharge respectively).See table (4).

AS presented in Table. (4) and illustrated in Fig. (22) there was a significance difference between the two groups concerning pain scores in VAS at 6 hour, at 24 hour and at discharge as (p<0.05).

Table (4): Comparison between the two studied groups according to pain scores in VAS

	Fistulectomy (A)	Fistulotomy with mersupialization (B)	T	p
Pain score At 6 hour	8.2±2.4	6.15±2.07	2.277	0.032*
Pain score At 24 hour	6.9±1.78	5.34±1.12	2.59	0.016*
Pain At Discharge	5.12±1.42	4.03±0.97	2.221	0.036*

*t-value was significant at 0.05significance level of P value.

Time of complete wound healing (weeks):

The time of complete wound healing was significantly longer in the laparoscopic group A with mean time 5.94 weeks than in group B with mean time 4.35 weeks, P value was 0.012. See table (5).

As presented in table (5) The Comparison between the two studied groups according to the time of complete wound healing showed a significance difference as ($p < 0.05$).

Table (5): Comparison between the two studied groups according to the time of complete wound healing (weeks)

	Fistulectomy (A)	Fistulotomy with mersupialization (B)
Rang	5-8	3-6
Mean±SD	5.94±1.56	4.35±1.37
t-value	2.69	
p-value	0.012*	

*t-value was significant at 0.05significance level of P value.

Postoperative complications (Urinary retention, Bleeding and wound infection):

The postoperative complications comparative study between both groups are not significant as $p < 0.05$ (0.748 in urinary retention, 0.076 in bleeding and 0.315 in wound infection).

Postoperative complications are more frequent in group A than in group B. See table (7).

Data presented in Table. (7) and illustrated in Fig. (25) Showed that the comparison between the two studied groups according to postoperative complications (Urinary retention, Bleeding and wound infection) was not significant as ($p < 0.05$).

Table (6): Comparison between the two studied groups according to postoperative complications

		Fistulectomy (A)	Fistulotomy with mersupialization (B)	Chi- square	
				χ^2	p-value
Urinary retention	NO	4	3	0.103	0.748
	%	30.76%	25%		
Bleeding	NO	3	0	3.14	0.076
	%	23.07%	0%		
Infection	NO	3	1	1	0.315
	%	23.07%	8.33%		

* χ^2 -value was significant at 0.05significance level.

Table (7): Comparison between the two studied groups according to incontinence development using three point Lickert scale

		Fistulectomy (A)	Fistulotomy with mersupialization (B)	Chi- square	
				χ^2	p-value
Never	NO	10	11	1.009	0.315
	%	76.92%	91.66%		
Sometimes	NO	3	1	1.009	0.315
	%	23.07%	8.33%		
Always	NO	0	0	1.009	0.315
	%	0%	0%		

* χ^2 -value was significant at 0.05significance level.

Incontinence development:

The postoperative comparative study in incontinence development between both groups are not significant as $p > 0.05$ (p value is 0.315).

Data presented in Table (8) and illustrated in Fig. (26) Showed that the comparison between the two studied groups according to incontinence development using three point Lickert scale was not significant as ($p>0.05$).

Recurrence:

The recurrence comparative study is not significant in both groups as p value is 0.587 ($p>0.05$).

Table (8): Comparison between the two studied groups according recurrence after six months follow up was not significant

Recurrence		Fistulectomy (A)	Fistulotomy with mersupialization (B)	Chi- square	
				χ^2	p-value
Yes	NO %	2 15.38%	1 8.33%	0.249	0.587
No	NO %	11 84.62%	11 91.66%		

* X^2 -value was significant at 0.05 significance level of P value.

4. Discussion

Despite being a common problem, perianal fistula has been pushed to the back pages because of the poor standardisation of the treatment protocols. The optimal surgical treatment for anorectal fistulae would be one that is associated with least recurrence rates, minimal incontinence and a good quality of life. Fistula in ano seems to be affecting males predominantly as evidenced by the present study population. Also, the presenting complaint is usually discharge from an external opening and in this study, this amounted to 88.3%.

Majority of our patients had previous history of perianal abscess, reaffirming that anorectal abscess is the acute inflammatory process that often is the initial manifestation of an underlying anal fistula. On comparing the results of two groups, the mean operating time in the fistulotomy group was significantly less. The meticulous dissection in fistulectomy and a need for achieving complete haemostasis usually increases the operating time. Hospital stay is less in fistulotomy group by almost a day, probably due to less post-operative pain (as evident by the pain scores) and smaller wound size.

Also, a higher incidence of urinary retention and wound infection in the fistulectomy group can be related to the increased pain and size of the wound respectively. As the tract is divided over a probe and the resultant wound is small, wound healing is faster in fistulotomy and present study confirms the same. In a study by **Kronberg et al., 1985** in low anal fistulas comparing fistulotomy with fistulectomy fistulotomy wounds healed quicker than fistulectomy wounds by at least one week.

None of the patients in present study suffered from major incontinence. **Shouler et al.,**

Two patients underwent recurrence after six months follow up in group A and only one patient in group B. See table (9) & figure (27).

Data presented in Table (8) and illustrated in Fig. (27) Showed that the comparison between the two studied groups according to recurrence after six months follow up was not significant as ($p>0.05$).

1986 reviewed Birmingham results, 96 of 115 patients had a fistulotomy and among them only ten experienced soiling, and only one patient complained of temporary incontinence of flatus.

Cavanaugh and colleagues in a study of 110 patients found trans-sphincteric tracts and the extent of external sphincter involvement to be risk factors for postoperative incontinence after fistulotomy. In the study by **Kronberg et al., 1985** the incidence of incontinence in fistulotomy group was 3.8% (1/26) whereas in fistulectomy group it was 14.28% (3/21). (**Khubchandani et al**) also reported similar results favouring fistulotomy.

During this study a follow up period of 6 months period only one patient from the fistulotomy group (1/12) developed recurrence. **Shouler et al., 1986** reported 7 recurrences in 96 out of 115 patients who underwent fistulotomy for low anal fistulas (8%).⁹ In the fistulectomy group, **Khubchandani et al** reported recurrence rate of 5.8% (4/68 cases), **Vasilevsky and Gordon et al., 2007** reported recurrence of 6.3% (10/160), (**Kronberg et al., 1985**) reported 9% (2/21) recurrence rate.

This retrospective study compares fistulectomy and fistulotomy for simple fistula in ano. We found that duration of wound healing and operative times were significantly shorter in fistulotomy than fistulectomy group. These findings are similar to those reported by (**Jain BK et al. and Kronberg et al., 1985**).

We found that duration of surgery was significantly shorter for the fistulotomy group as compared to the fistulectomy group. This can be explained by more effort required to remove the whole tract in fistulectomy patients as compared to less time-consuming laying open of tract. These findings are

similar to those reported by of (Jain BK et al., 2012). In our study, recurrence and post-operative pain were comparable between the two groups. These findings are similar to those reported by (Jain BK et al., 2012).

Limitations of the current study included inherent drawbacks of retrospective studies. The wound healing time and incontinence suffer from recall bias as it was inquired from patients over the telephone. Similarly, the best way to determine wound healing and recurrence is clinical examination. Therefore, the duration for which patients kept a dressing/pad was taken as surrogate marker for wound healing. Operative time may be affected by the level of operator i.e. consultant or resident; however, it does not drift the results to one procedure since both are done by operators of variable levels.

Strengths of the study included adequate sample size for assessing duration of wound healing and follow-up of 6 months for all the patients. We included only primary and simple fistula in ano to avoid confounding effect of different fistula types.

Our study was conducted on 25 patients suffering from simple perianal fistula, patients were divided into two groups: group A was treated by fistulectomy and group B was treated by fistulotomy with marsupialization and the mean age in group A was 27.87 ± 5.47 years and in group B it was 28.92 ± 6.27 years.

The operative time in our study was significantly shorter in group B, with a mean of 20.22 ± 8.46 min, compared with group A, with a mean of 30.7 ± 11.94 min. This is because in fistulectomy we cored out the fistula tract completely after probing and it took time for dissection of the fistula tract and for the identification of structures. In addition, after removal of the fistula tract, closure of the internal opening was performed, which took more time, whereas in fistulotomy we only layed open the tract after probing from the external opening to the internal opening of the fistula; this technique saves time leading to less operative time. According to our study.

In this study, there was a significant decrease in the time needed to return to normal activity and need for analgesics in group B, with a mean of 10.84 ± 3.45 days, compared with group A, with a mean of 15.54 ± 3.77 days.

Diclofenac sodium ampoule is used twice daily, and we assess how many days the patient needed analgesic. In group A, the pain lasts longer postoperatively because of more dissection around the fistula tract and after coring there is raw area left, whereas in group B laying out the tract with no dissection leaves less raw area leading to less pain postoperatively. The operative pain (VAS score) in our study was significantly shorter in group B, with a

mean of 6.15 ± 2.07 min (at 6 hours), compared with group A, with a mean of 8.2 ± 2.4 min.

In this study, the postoperative wound infection occurs in one (8.33%) patient in group B and in three (23.07%) patients in group A, with no statistical significance. Wound infection occurs because of bad hygiene of the patients and causes delayed wound healing; this infection was treated early by antibiotics and regular dressing, and there was good response.

In our study, change in the continence status occurred in zero patient scoring in both groups. No patients suffered from complete incontinence to stool from both groups in our study, and the three patients with partial incontinence to flatus scored by Lickert three point scale and were assured; this condition was temporary, as the incontinence disappeared after 8 weeks and the patients regained complete continence after that. There is no statistically significant difference between the two groups, and assessment also continued during the follow up period. No complete incontinence occurred in any patient in our study.

In our study, wound healing (complete epithelialization and absence of discharge) was significantly faster in group B, with a mean of 4.35 weeks, which is less than group A, with a mean of 5.94 weeks.

Recurrence after six months follow up was not significant (p value=0.587) in our study but in group B one patient of total 12 patients underwent recurrence, compared with group A, with two patients of 13 patients. This is because in fistulectomy we cored out the fistula tract completely after probing and it took time for dissection of the fistula tract and for the identification of structures.

The postoperative stay in our study was significantly shorter in group B, with a mean of 1.7 ± 0.59 days, compared with group A, with a mean of 2.4 ± 0.8 day.

The postoperative bleeding in our study was not significant (p value is 0.076) but in group B no patients had a bleeding, compared with group A, with three patients had a bleeding.

The postoperative urinary retention in our study was not significant (p value is 0.748) but in group B three patients had a urinary retention, compared with group A, with four patients had a urinary retention.

References

1. Arderne J. In: Power D (ed) Treatises of fistula in ano haemorrhoids and clysters. London: Trubner & co and Oxford University Press, 1910.
2. Dukes C. Frederick Salmon: Founder of St Mark's Hospital, London. J Med Hist 1959; 3: 312–316.

3. Khubchandani M. Comparison of results of treatment of fistula-in-ano. *J R Soc Med.* 1984;77 (5):369-71.
4. Kronborg O. (1985). To lay open or excise a fistula in ano: a randomized trial. *Br J Surg.* 1985; 72: 970.
5. Limura E, Pasquale Giordano (2015), Department of Colorectal Surgery, Whipps Cross Hospital, Barts Health NHS Trust, London E111NR, United Kingdom, Modern management of anal fistula, *World Journal of Surgery.*
6. Lockhart-Mummery JP. Discussion on fistula-in-ano. *Proc R Soc Med* 1929; 22: 1331–1358.
7. Shouler PJ, Grimley RP, Keighley MR, Alexander- Williams J. Fistula-in-ano is usually simple to manage surgically. *Int J Colorectal Dis.* 1986;1 (2):113-5.
8. Starck, M. Bohe, B. Fortling and L. Valentin (2005), Department of Surgery, Department of Obstetrics and Gynecology, Malm University Hospital, Malmö, Lund University, Sweden and B-K Medical, Herlev, Denmark., Endosonography of the anal sphincter in women of different ages and parity.
9. Takayuki Toyonaga, Makoto Matsushima, Takashi Kiriu, Nobuhito Sogawa, Hiroki Kanyama, Naomi Matsumura, Yasuhiro Shimojima, Tomoaki Hatakeyama, Yoshiaki Tanaka, Kazunori Suzuki and Masao Tanaka (2007), Department of Surgery, Matsushima Hospital Colo-Proctology Center, 19- 11 obehoncho, Nishi-ku, Yokohama, Japan, Factors affecting continence after fistulotomy for intersphincteric fistula-in-ano.
10. Vasilevsky CA, Gordon PH. Results of treatment of fistula-in-ano. *Dis Colon Rectum.* 1985;28 (4):225- 31.

9/3/2019