



Histoacryle Injection VS. Silver Nitrate Injection in Treatment of Low Non Branching Anal Fistula

Prof. Dr. Waleed Ali EL-Baz, Dr. Hesham Ahmed Abdel-Wahab, Dr. Mohammed Ahmed Korany & Esraa Lamloum Mohammed *

General Surgery Department, Faculty of Medicine, Beni-Sueif University

Abstract

Background: Anal fistula and anal sepsis are the part of spectrum of anorectal suppurative diseases, A fistula-in-ano is a hollow tract lined with granulation tissue connecting a primary opening inside the anal canal to a secondary opening in the perianal skin through which an abscess has been drained or has spontaneously ruptured. **Aim of the Work:** To compare injection of histoacryle and irrigation of silver nitrate in treatment of low non branching anal fistula. **Patients and Methods:** This study was held in Beni-Sueif university hospital, at the general surgery department from October 2019 to June 2020 on 50 patients that divided into 2 groups randomly selected (SN group and Histoacryle group). **Results:** There is a significant difference found between two groups in favor for SN. As silver nitrate is much less expensive with a lower recurrence rates, while histoacryle is more expensive with higher recurrence rates. **Conclusion:** Both silver nitrate and histoacryle can be used in treatment of low non branching anal fistula effectively with no evident complications and good success rate specially for patients refusing surgery and for patients with high risk for anesthesia, favoring SN injection as it has lower recurrence rates and cheaper cost in comparison with HA injection.

Keywords: Histoacryle Injection - Silver Nitrate Injection - Non Branching Anal Fistula.

1. Introduction:

Etiologies of fistulae are cryptoglandular, Crohn's disease and ulcerative

colitis. Fistulae is classified as simple-intersphincteric, low transphincteric and

complex -high transphincteric, suprasphincteric, extrasphincteric, recto-vaginal, Crohn and ulcerative colitis ⁽¹⁾.

Anal sepsis can occur at any age though it is more common in third or fourth decade of life. Average global age is 34 years (37 years in males and 28 years in females) ⁽²⁾. Anal fistula is one of the most common presenting anorectal diseases with an incidence of 8.6e10 per 100,000 people per year ⁽³⁾.

Hazards of fistula are too many ranging from distressing symptoms (pain, swelling, and discharge that can cause skin irritation, excoriation, and pruritus, sepsis and inflammation that affect quality of life significantly). The lack of any standard surgical procedure and heterogeneity of anorectal fistula warrants the surgeon to use his “judgment” more than in most colorectal diseases ⁽⁴⁾.

Anal fistulas are notoriously difficult to manage, but surgery remains the definitive therapeutic approach. There are numerous techniques to treat anal fistula, with the goals of draining infection, eradicating the fistulous tract, and avoiding persistent or recurrent disease while preserving anal sphincter function ^(5,6).

Surgical procedures include fistulotomy ⁽⁷⁾, seton placement ⁽⁸⁾, mucosal advancement flap ⁽⁹⁾, and Ligation of the intersphincteric fistula tract (LIFT) ⁽¹⁰⁾. However, there are complications of surgical

treatment (post-operative complications including early complications as urine retention, heavy bleeding or discharge from the fistulotomy site, clot formation inside an existing hemorrhoid and fecal impaction. Also, late complications include anal stenosis, bowel incontinence, and recurrence of fistula and delayed wound healing ⁽¹¹⁾.

Recently, a number of new sphincter-preserving techniques have been developed and proposed, all with the common goal of minimizing the injury to the anal sphincters and optimize the functional outcome such as Ligation of intersphincteric fistula tract, Plug, Fibrin glue, Fistula laser closure, Video-assisted anal fistula treatment and Adipose-derived stem cells ⁽¹²⁾.

The application of cyanoacrylate glue and an extracellular matrix plug were claimed as an alternative method to surgery in patients suffering from fistula-in-ano as safe and noninvasive methods ⁽¹³⁾.

Another noninvasive method in fistula is treatment using silver nitrate (SN) 1% solution. SN is known to have an antiseptic action and the capacity to produce chemical burn destroying the surrounding granulation tissue favoring cicatrisation ⁽¹⁴⁾.

Aim of the work:

The aim of the study is to compare injection of histoacryle and irrigation of silver nitrate in treatment of low non branching anal fistula.

2. Patients and Methods:

1) Type of study:

This study is presented to prospectively evaluate the use of either histoacryle or silver nitrate in treatment of low non branching anal fistula.

2) Study design:

The study was held in Beni-Suef university hospital, at the general surgery department from October 2019 on 50 patients to June 2020 that were divided into 2 groups which were randomly selected (SN group and Histoacryle group).

3) Study population:

Inclusion criteria:

- Age: Adult age group from 18ys to 70ys (higher incidence and higher risk for anesthesia in old patients).
- Patients refusing surgery.
- Patients at high risk for anesthesia (ASA3)
- Low fistula with internal opening below anorectal junction.
- Non branching anal fistula.

Exclusion criteria:

- Below 18 years age group and pregnant females.
- Perianal abscess.
- Branching fistula.
- Recurrent fistula.

- Fistulae on top of inflammatory bowel diseases.
- High fistula with internal opening above anorectal junction.
- Presence of bad general conditions such as systemic lupus erythematosus, immunocompromised patients and cortisone chronically administrating patients.

4) Tools of the study:

All patients in this study were subjected to the following:

A) Clinical assessment including:

Relevant history:

Detailed complaint & present history that showed presence of one or more of the following:

- Pain and induration around the anus.
- discharge from an opening around the anus.
- Irritation of the skin around the anus from drainage.
- Pain with bowel movements.
- Bleeding.

Relevant past history:

Presence of previous related complain or already established diagnosis.

Examination:

Diagnostic procedures included a careful inspection, digital examination of the anorectum and proper radiological assessment.

An inspection of the anus and the surrounding was done for visible signs of a fistula. The opening of a fistula is usually a red and inflamed spot that may ooze pus. Sometimes gentle pressure on the skin around the tract will be sufficient to express a purulent or bloody discharge. If a fistula is identified, the path of the fistula may be able to be uncovered, as the tunnel structure is often hardened underneath the skin. This can then help to find any secondary tracts that may branch off of the original fistula tract.

A rectal examination may also be required to assess the function of the sphincter muscles. This involves the practitioner inserting a finger into the anus and rectum in order to palpate the fistula track and surrounding tissue, for evidence of infection or extension of the fistula. The patient is also asked to squeeze the sphincter muscles on the examining finger to demonstrate their function.

Fistulae can be broadly categorized into two main types according to their location: low-level fistulae and high-level fistulae. Low-level fistula includes subcutaneous, submucous and low anal fistula whereas high-level fistula includes high anal and pelvic-rectal fistula. Additionally, Park's classification can be used to describe the type of the fistula ⁽¹⁵⁾.

Also, fistula was examined for its site and length according to The Goodsall Rule depending on the location of the external opening:

- External opening posterior to the transverse anal line – fistula tract will follow a curved course to the posterior midline.
- External opening anterior to the transverse anal line – fistula tract will follow a straight radial course to the dentate line.
- Finally, examination for presence of possible complications should be excluded.

B) Laboratory investigations:

Pre-procedure investigations is done for all patients in the form of CBC, PT, PC, INR, ESR, FBS, kidney function test and liver function test.

C) Radiological investigations:

All patients performed the anorectal ultrasound (with or without MRI) after admission.

- Transanal ultrasound imaging was performed by using a higher frequency linear probe (8 – 10 MHZ) with a long transducer length similar to the transvaginal probe, patients will be imaged in supine and lateral positions.
- MRI was performed by 1 tesla closed magnetic resonance device.

Ultrasound imaging protocol:

One approach was used: **trans-anal.**

Fistulous tracts were assessed for width, length, location, extent and relation to external and internal anal sphincters.

The patient was examined twice, once before the procedure, and another 3 months after the procedure.

MRI imaging protocol (in some cases):

Coronal and axial sections were taken with sequences of T1, T2 and STIR along the pelvic floor.

5) Type of sampling techniques:

A randomized sample on two groups: SN group (25 patients) and HA group (25 patients) by the blind technique.

6) Injection procedure:

The procedure was done in the surgical theater under absolute aseptic conditions. Patients underwent local anesthesia (pudendal nerve block).

1. Silver nitrate:

Preparation:

1/2 liters of silver nitrate 5% solution were prepared by adding 25 grams of silver nitrate crystals or sticks with 1/2 liters of double distilled water associated with gentle mixing. The solution is stored in a black container (because its molecules are photo sensitive). In this procedure we injected patients with 5cm SN 5% in each session for 7 sessions.

Technique:

All enrolled patients underwent transrectal U/S or MRI to determine their pretreatment state before administration of silver nitrate.

The patient was positioned in the lithotomy position with local Xylocaine gel application then local infiltration anesthesia and pudendal nerve block. An olive-tipped malleable metal

probe was inserted through the external orifice to check the patency. The probe is inserted just a few mm inside the tract not through the whole tract in order not to perform a false tract. Then after removing the probe, an 18G intravenous cannula was inserted through the external orifice into the fistula tract without the metal needle.

Pudendal nerve block:

Pudendal nerve block is performed transperineally in the lithotomy position. Injection of 5-10 ml of local anesthetic is carried out percutaneously just posterior to the ischial spine at the attachment of sacrospinous ligament. Ischial spine can be palpated transrectally or transvaginally. Pudendal nerve block is often combined with perineal infiltration of local anesthetic. Spinal Koback needle is used. After placing the needle (transvaginally or transperineally) underneath the ischial spine on each side, the needle is advanced 1-1.5 cm through sacrospinous ligament and 5-10 ml of 1% lignocaine or, 2% chloroprocaine is injected. Sacrospinous ligament can be palpated and its junction with the spine may be taken as landmark and the finger serves as guide. The needle is passed lateral to the finger through the ligament for 1 cm until a loss of resistance is appreciated. The tip now lies in the area of the pudendal nerve. As pudendal vessels are closely associated so after aspiration, 5-10 ml of local anaesthetic solution is injected. The block is repeated on the other side. Right index finger is used for the

right and left for the left pudendal nerve, inside vagina or anal canal ⁽¹⁶⁾.

Once the cannula was properly positioned, 1–5 ml of saline was injected first to wash the fistula tract. The internal opening was closed by a simple suture using proctoscope to avoid dripping of SN inside rectum, then 1-5 ml of 5% silver nitrate solution was delivered into the tract of the fistula while withdrawing the cannula from the tract. Injection is with gradual withdrawal of the cannula down to the external opening. The perianal skin was protected by a drape around the external orifice because the solution barely fills the tract, the anal canal should be wiped carefully. No additional effort was made to prevent spillage into the anal canal. Most of the patients experience immediate tenesmus as a sign of successful SN injection.

2. Pudendal nerve block:

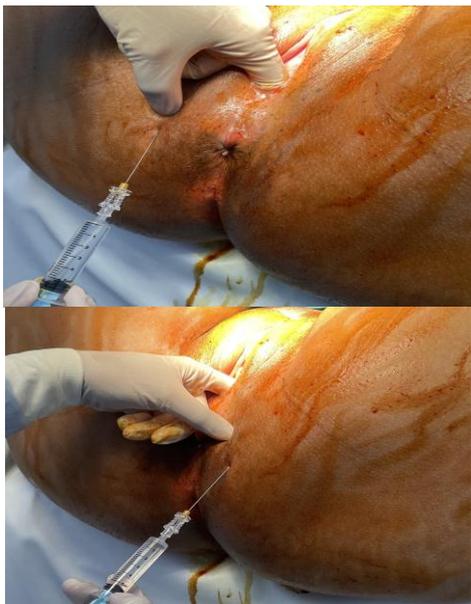


Figure (1): Pudendal nerve block.

3. Probing:



Figure (2): Probing.

4. Saline wash:



Figure (3): Saline wash.

5. Silver nitrate injection:



Figure (4): Silver nitrate injection.

6. Successful injection 6 months after:



Figure (5): Successful healing 6 months after injection of silver nitrate.

7. Histoacryl:

Preparation:

We used the ready-made ampoules.

Technique:

In the operative room, the patient was placed in lithotomy position, and the peri-anal skin was first cleaned and patient underwent local anesthesia as mentioned before,

The internal and external openings were carefully identified by probing as mentioned before, and the track was washed with normal saline. Histoacryle glue was injected through 18G intravenous cannula till the glue appears at the internal opening indicated by bubbling at the internal opening.

Bidigital pressure was applied both at the internal and external opening for 3 minutes. Polymerization of the glue occurred in within 30 s during which patients felt a little discomfort in the form of heat, so the injection should be placed as fast as possible

and patency of the tract should be insured prior to injection.

Tenesmus is much less evident than in SN.

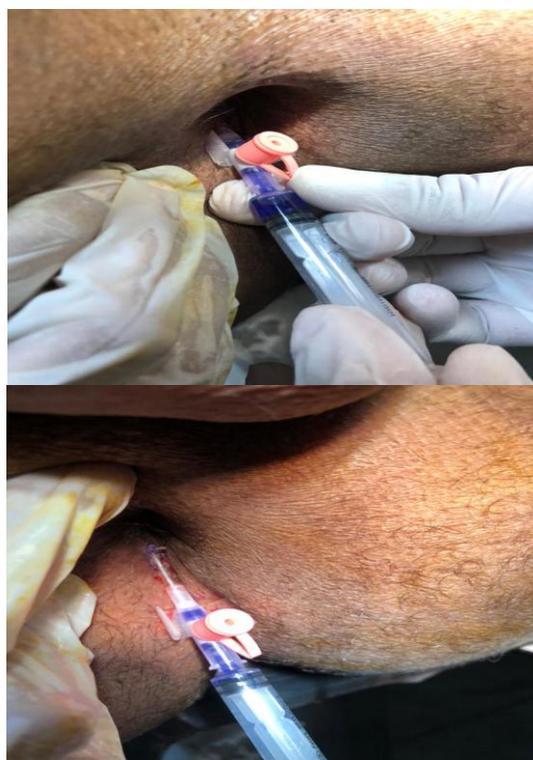


Figure (6): Histoacryl injection.

8. Medication:

Patients with heavy perianal discharge were subjected to medical treatment in the form of broad-spectrum antibiotics and anti-anaerobes antibiotics prior to the procedures for at least one week. Otherwise there is no need for medical treatment even after injections apart from pain killers on demand.

9. Number of injections:

Silver nitrate is injected in the form of 5cm of 5% SN every week for minimum 5 sessions and up to maximum 7 sessions. While histoacryle is injected in the form of ready-made 5ml ampoules once or twice with one month apart.

After administering the treatment, the patients were followed up with weekly outpatient visits, and the patients' complaints were assessed at each visit. If the patient reported cessation of discharge for at least 30 days, U/S was performed to assess the radiological healing.

Ethical Issues:

All the procedure was explained well to the patients, describing the aim of the study, and we tried to provide the suitable investigation to them. Informed consent was obtained from all patients.

8) Follow up & evaluation:

One week and 6 months after procedure, patients were regularly assessed with 2 methods:

- **Clinically:** for improvement of clinical picture (as mentioned before).

Table (1): Evaluation of post-operative pain according to Numeric pain score (*National Institutes of Health, 2012*)

Rating	Pain Level
0	No Pain
1-3	Mild Pain (nagging, annoying, interfering little with ADLs)
4-6	Moderate Pain (interferes significantly with ADLs)
7-10	Severe Pain (disabling; unable to perform ADLs)

Recurrence is defined as clinical reappearance of the fistula after complete healing of the surgical wound, occurring within one year after the procedure⁽¹⁷⁾.

Clinical diagnosis of recurrence:

Recurrence was suspected when the patient presented with pain, swelling, or discharge that can cause skin irritation, excoriation, and pruritus. Bleeding may occur. Clinical examination was then conducted to allow for inspection of any recurrence or coexisting problems. Palpation of the tract from the external opening to the anal verge. Then, digital rectal examination (DRE) was done to exclude recurrence and ensure anal tone. Finally, an office proctoscopy examination may be done.

Recurrence of anal fistula was suspected when one of the following signs was detected: More than one external openings, distant external opening away from the anal verge, anterior anal fistula, internal opening above the dentate line.

- **Radiological:** by anorectal ultrasonography (MRI might have been used in some cases)

Radiological diagnosis of recurrence

There are three ultrasonography methods for the evaluation of recurrent perianal fistulae.

- Endoanal ultrasound (EAUS)
- Transvaginal ultrasound (TVUS)
- Transperineal ultrasound (TPUS)

These can also be applied in combination. Infusion of hydrogen peroxide into the

fistulous tract renders it hyperechoic, thus facilitating its delineation.

Endoanal ultrasonography is deemed less sensitive than endoanal MR for deep supra levator disease.

According to comparative meta-analysis, EAUS and MRI had comparable sensitivities at detecting anal fistulas, yet with higher specificity in favor of MRI (69% vs 43%).

A recent radiologic study concluded that 3D-EAUS may represent the first-line diagnostic tool. In cases of fistulas classified by 3D-EAUS, MRI may be indicated as adjunctive diagnostic imaging examination, to more carefully describe the fistulas' complete anatomy.

9) Time table:

- Preparation of the study took 2 weeks.
- Collection of literature & practical work of the study took 6 months.
- Data analysis, statistics & thesis preparation took 2 weeks.

Statistical Analysis:

All data were subjected to revision and validation then description and analysis on IBM-compatible PC by using SPSS (Statistical Package for the Social Science)

program version 22.0.0, Microsoft Office Excel 2007, and Graph Pad Prism 6.

Descriptive statistics were performed for all studied parameters in the three studied groups and were presented in the form of mean, median, standard deviation (SD), minimum, maximum, range, and percentages.

Analytical comparison between different groups was done by using student t test for comparing parametric data when normally distributed. For comparing non parametric data, Fisher's exact test was used instead of chi-square test as Fisher's test calculates an exact P value, while chi-square only calculates an approximation.

The level of significance was calculated according to the following probability (P) values:

- $P > 0.05$ = non-significant (NS).
- $P < 0.05$ = significant (S).
- $P < 0.001$ = highly significant (HS).

3. Results:

Table (2): Distribution of the studied cases according to Type of injection

Type of injection	No.	%
Silver nitrate	25	50.0%
Histoacryl	25	50.0%

Table (3): Distribution of the studied cases according to Age, Sex and Co-morbid factor

		No.= 50
Age	Mean ± SD	37.84 ± 9.35
	Range	22 – 55
Sex	Female	12 (24.0%)
	Male	38 (76.0%)
Co-morbid factor	No	30 (60.0%)
	DM	7 (14.0%)
	HTN	7 (14.0%)
	Cardiac	6 (12.0%)

Table (4): Comparison between Silver nitrate (no. = 25) and Histoacryl (no. = 25) regarding Age, Sex and Co-morbid factor

		Silver nitrate	Histoacryl	Test value	P-value	Sig.
		No.= 25	No.= 25			
Age	Mean ± SD	38.20 ± 9.35	37.48 ± 9.52	0.270•	0.789	NS
	Range	23 – 55	22 – 55			
Sex	Female	5 (20.0%)	7 (28.0%)	0.439*	0.508	NS
	Male	20 (80.0%)	18 (72.0%)			
Co-morbid factor	No	15 (60.0%)	15 (60.0%)	0.286*	0.963	NS
	DM	4 (16.0%)	3 (12.0%)			
	HTN	3 (12.0%)	4 (16.0%)			
	Cardiac	3 (12.0%)	3 (12.0%)			

P-value > 0.05: Non significant (NS); P-value < 0.05: Significant (S); P-value < 0.01: highly significant (HS)

*: Chi-square test; •: Independent t-test

The Previous table shows that there was non statistically significant difference found between two groups regarding Age, Sex and Co-morbid factor.

Table (5): Distribution of the studied cases according to Anal pain, Anal discharge, Anal Bleeding, Anal discomfort, Anal dermatitis and Pain Score

		No.= 50
Anal pain		33 (66.0%)
Anal discharge		25 (50.0%)
Anal Bleeding		9 (18.0%)
Anal discomfort		31 (62.0%)
Anal dermatitis		18 (36.0%)
Pain Score	Mean \pm SD	3.30 \pm 1.21
	Range	1 – 5

Table (6): Distribution of the studied cases according to Diagnosis M.R.I, Endo anal U.S and Number of injections

		No.= 50
Diagnosis by MRI		6 (12%)
Diagnosis by endoanal US		50 (100.0%)
Number of injections of silver nitrate	Mean \pm SD	6.02 \pm 0.82
	Range	5 – 7

Table (7): Comparison between Silver nitrate (no. = 25) and Histoacryl (no. = 25) regarding Anal pain, Perianal swelling, Anal discharge, Anal Bleeding, Anal discomfort, Perianal dermatitis and Pain Score

	Silver nitrate	Histoacryl	Test value	P-value	Sig.
	No. = 25	No. = 25			
Anal pain	19 (76.0%)	14 (56.0%)	2.228	0.136	NS
Perianal swelling	5 (20.0%)	4 (16.0%)	0.136	0.713	NS
Anal discharge	21 (84.0%)	21 (84.0%)	0.000	1.000	NS
Anal Bleeding	7 (28.0%)	2 (8.0%)	3.388	0.066	NS
Anal discomfort	15 (60.0%)	16 (64.0%)	0.085	0.771	NS

Perianal dermatitis		9 (36.0%)	9 (36.0%)	0.000	1.000	NS
Pain Score	Mean ± SD	3.05 ± 1.22	3.64 ± 1.15	-1.404	0.170	NS
	Range	1 – 5	2 – 5			

P-value > 0.05: Non significant (NS); P-value < 0.05: Significant (S); P-value < 0.01: highly significant (HS)

***: Chi-square test; •: Independent t-test**

The Previous table shows that there was statistically none significant difference found between two groups regarding Anal pain, Perianal swelling, Anal discharge, Anal Bleeding, Anal discomfort, Perianal dermatitis and Pain Score.

Table (8): Comparison between Silver nitrate (no. = 25) and Histoacryl (no. = 25) regarding Recurrence, Complications and Post procedure pain

		Silver nitrate		Histoacryl		Test value*	P-value	Sig.
		75% no		55% no				
		No.	%	No.	%			
Recurrence		5	20.0%	12	48.0%	4.367	0.016	S
Complications		0	0.0%	1	4.0%	1.020	0.312	NS
Post procedure pain	Mild	18	72.0%	16	64.0%	0.368	0.544	NS
	Moderate	7	28.0%	9	36.0%			

P-value > 0.05: Non significant (NS); P-value < 0.05: Significant (S); P-value < 0.01: highly significant (HS)

***: Chi-square test; •: Independent t-test**

The Previous table shows that there was no statistically significant difference found between two groups regarding Complications and Post procedure pain, and there was statistically significant difference found between two groups regarding Recurrence.

Complications:

HA was complicated by abscess formation which was treated by incision and drainage while there was no complication from SN in this study.

Table (9): Comparison between Silver nitrate and Histoacryl regarding Mean cost of the all treatment course for a patient

		Silver nitrate	Histoacryl	Test value	P-value	Sig.
Cost	Mean ± SD	118.40 ± 24.44	490.00 ± 175.00	-10.515	0.000	HS
	Range	60 – 140	350 – 700			

The previous table shows the mean cost of the all treatment course for a patient.

4. Discussion:

Anal fistula represents one of the most common anorectal disorders in the surgical practice. Reviewing the current literature, all efforts have been directed toward improving the outcome of management of anal fistula by the application of new diagnostic tools and the introduction of novel treatment modalities (18).

Hazards of fistula are too many ranging from distressing symptoms (pain, swelling, and discharge that can cause skin irritation, excoriation, and pruritus, sepsis and inflammation that affect quality of life significantly). The lack of any standard surgical procedure and heterogeneity of anorectal fistula warrants the surgeon to use his “judgment” more than in most colorectal diseases (19).

Recently, a number of new sphincter-preserving techniques have been developed and proposed, all with the common goal of minimizing the injury to the anal sphincters and optimize the functional outcome such as Ligation of intersphincteric fistula tract, Plug,

Fibrin glue, Fistula laser closure, Video-assisted anal fistula treatment and Adipose-derived stem cells (20).

In the study by (21), complete clinical healing was achieved in 18% of patients after single irrigation with silver nitrate on an outpatient basis without any anesthetic requirement. Moreover, 34% of the sample achieved complete clinical healing after repeated irrigations.

In the same line, (22) have reported a cohort of 113 infants diagnosed of anal fistula treated with SN 30% solution, with an impressive complete healing rate of 73% without major complications.

As regard the histoacryl injection, (23) which study the effect of histoacryl in treatment of anal fistula in children and reported that (94%) of patients have had successful closure of their fistula, and one of them healed from a second injection and only two patients showed recurrence.

⁽¹³⁾ treated 20 patients with low anal fistulas by histoacrylate glue application in the fistula. These patients were followed clinically for up to six months and seventeen patients (85%) achieved a cure with just one application of the adhesive in children.

The aim of the study was to compare injection of histoacryle versus irrigation of silver nitrate in treatment of low non branching anal fistula.

This study was held in Beni-Suef university hospital, at the general surgery department on 50 patients from October 2019 to June 2020 that divided into 2 groups randomly selected (SN group and Histoacryle group).

According to our study the represented symptoms, 66% were with anal pain, only 18% were with perianal swelling, 48% were showing anal discharge, 82% showed no bleeding, 62% were with anal discomfort, 64% were with no perianal dermatitis.

As regard to the diagnosis, 12% only diagnosed through MRI and all patients were diagnosed with anal ultrasound.

This prospective study is the first to compare the utility of silver nitrate and histoacryl irrigation in the treatment of anorectal fistulas. The silver nitrate new procedure is non-invasive, lacks the complications of the conventional treatment modalities, and offers the opportunity for treatment on an outpatient basis.

Also, the approach of injection of a histoacryl adhesive material is a minimally invasive technique, without surgical dissection, and can be carried out in a short duration of time. Minimal complications were encountered, which may be attributed to the small number of cases and the short follow-up period in our study and the procedure can be done by junior surgeons.

In our study, the mean number of irrigations of SN was 6.02 ± 0.82 with the range between 5-7 times in comparison with. ⁽²¹⁾ that showed the median number of irrigations needed for complete clinical healing was 4 with the range between (1–10).

As regard to recurrence, 80% showed no recurrence and 20% showed recurrence in SN, while 52% showed no recurrence and 48% showed recurrence in histoacryl and according to the post procedure pain, 18% were with mild pain and 7% were with moderate pain in SN, While the post procedure pain, 64% were with mild pain and 36% were with moderate pain in histoacryl.

According to post procedure complications in our study, all patients didn't have any complications apart from recurrence with silver nitrate but the histoacryl group showed perianal abscess complications.

In our study, while **comparing** the **two** procedures, there was significant difference found between two groups regarding Recurrence (with P-value = 0.016) and

according to the procedure cost, there was high significant difference between silver nitrate and histocryle with a range of (60-140EGP) for silver nitrate and (50-700EGP) for histocryle.

In conclusion, there is a significant difference found between two groups in favor for SN. As silver nitrate is much less expensive with a lower recurrence rates, while histoacryle is more expensive with higher recurrence rates.

Strength of the study:

This is the first study that compared histoacryl and silver nitrate to show the difference between them to show the best in treating low anal fistula with no complications and with high satisfaction.

Limitation of the study:

Major limitations of this study are the small sample size and the short follow-up duration. Longer follow-up is warranted because it is likely that the instances of radiologic incomplete healing may turn out to be failures. Additionally, we did not compare this procedure with traditional treatment modalities (eg, fistulotomy), and we did not use a placebo or a sham procedure as a study arm to assess the objective impact of silver nitrate on anorectal fistula healing.

5. Conclusion:

It was concluded that both silver nitrate and histoacryle can be used in treatment of low non branching anal fistula effectively with no evident complications and good

success rate specially for patients refusing surgery and for patients with high risk for anesthesia, favoring SN injection as it has lower recurrence rates and cheaper cost in comparison with HA injection.

6. References:

1. Sileri P, Boehm G, Franceschilli L, Giorgi F, Perrone F, Stolfi C. Collagen matrix injection combined with flap repair for complex anal fistula. *Colorectal Dis.* 2012; 14(3): 24–8.
2. Charúa LG, Osorio RH, Navarrete TC, Amador RC, Avendaño OE. Surgical management of anal fistula. *Revista de gastroenterologia de Mexico.* 2004; 69(4): 230-5.
3. Kontovounisios C, Tekkis P, Tan E, Rasheed S, Darzi A, Wexner SD. Adoption and success rates of perineal procedures for fistula-in-ano: a systematic review. *Colorectal Dis.* 2016; 18(5): 441e458.
4. Demirel AH, Seyfettin K. Silver nitrate cauterization for anal fistulas with high blind tract chemical therapy in complicated anal fistulas. *Euroasian J Hepato-Gastroenterol.* 2013; 3: 49-53.
5. Davis BR, Kasten KR. Anorectal abscess and fistula. Steele SR, Hull TL, Read TE, Saclarides TJ, Senagore AJ, Whitlow CB, eds. *The ASCRS Textbook of Colon and Rectal Surgery. 3rd ed.* New York: Springer; 2016; 1: 215-44.

6. Williams JG, Farrands PA, Williams AB. The treatment of anal fistula: ACPGBI position statement. *Colorectal Dis.* 2007; 9(4): 18-50.
7. Blumetti J, Abcarian A, Quinteros F, Chaudhry V, Prasad L, Abcarian H. Evolution of treatment of fistula in ano. *World J Surg.* 2012; 36(5): 1162-7.
8. Memon AA, Murtaza G, Azami R, Zafar H, Chawla T, Laghari AA. Treatment of complex fistula in ano with cable-tie seton: a prospective case series. *ISRN Surg.* 2011: 636952.
9. Abbas MA, Lemus-Rangel R, Hamadani A. Long-term outcome of endorectal advancement flap for complex anorectal fistulae. *Am Surg.* 2008; 74(10): 921-4.
10. 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(3): 581-6.
11. Juan L. Fistula-in-Ano, Medscape, <https://emedicine.medscape.com/article/190234-overview>. Available at 2018.
12. Limura E, Giordano P. Modern management of anal fistula. *World J Gastroenterol* 2015; 21(1): 12-20.
13. Jain SK, Kaza RC, Pahwa M, Bansal S. Role of cyanoacrylate in the management of low fistula in ano: Aprospective study. *Int J Colorectal Dis* 2008; 23: 355-58.
14. Tomasello G, Bellavia M, Daminai F, Damiano G, Palumbo V, Fiorentini T. Argentum-quarz solution in the treatment of anorectal fistulas: is it possible a conservative approach? *Med Hypoth.* 2012; 79: 542-3.
15. Parks A, Gordon P, Hardcastle J. A classification of fistula-in-ano. *BJS.* 1976; 63: 1-12.
16. Manzoor A, Zahid H, Adnan Z. Haemorrhoidectomy Using Pudendal Nerve Block and Local Infiltration. *Gomal Journal of Medical Sciences*, 2010; 8.
17. van Onkelen RS, Gosselink MP, van Rosmalen J, Thijsse S, Schouten WR. Different characteristics of high and low transsphincteric fistulae. *Colorectal Dis.* 2014; 16(6): 471-5.
18. Akiba RT, Rodrigues FG, da Silva G. Management of Complex Perineal Fistula Disease. *Clin Colon Rectal Surg.* 2016; 29(2): 92-100.
19. He Z, Du J, Wu K. Formation rate of secondary anal fistula after incision and drainage of perianal Sepsis and analysis of risk factors. *BMC Surg* 2020; 20: 94.
20. Elsebai OI, Ammar MS, Abdelhaleem MS, Khattab AA. Evaluation of ligation of intersphincteric fistula tract technique in treatment of simple transsphincteric fistula. *Egypt J Surg* 2019; 38: 604-9
21. Attaallah W, Tuney D, Gulluoglu B, Ugurlu M, Guna O, Yegen C. Should we consider topical silver nitrate irrigation as a

- definitive nonsurgical treatment for perianal fistula? *Di Colon Rectum*. 2014; 57: 882–7.
22. Utsunomiya T, Kikuta S, Shibate O, Yamabe M. Evaluation of the corrosive therapy of injection of silver nitrate solution into perianal fistulas in infants. *Nippon Daicho Komonbyo Gakkai Zasshi*. 2014; 47: 151-6.
23. Osman MA, Elsharkawy MA, Othman MH. Repair of fistulae in-ano in children using image guided Histoacryl injection after failure of conservative treatment. *J Pediatr Surg*. 2013; 48(3): 614-618.