https://doi.org/10.33878/2073-7556-2020-19-4-115-130

ANOPLASTY AND LATERAL INTERNAL SPHINCTEROTOMY FOR CHRONIC ANAL FISSURE (systematic review and meta-analysis)

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INTRODUCTION: lateral internal sphincterotomy (LIS) is considered the "gold standard" therapy for chronic anal fissure (CAF). Advantages of LIS over other surgical techniques include higher rate of healing and lower risk of fissure recurrence. However, this procedure is associated with a high risk of anal incontinence (AI) in the postoperative period. Anal advancement flap (AAF) is an alternative surgical procedure for CAF, which requires the use of local flaps. Anal advancement flap is associated with a significantly lower risk of anal incontinence.

AIM: to compare short-term and long-term outcomes of anal advancement flap and lateral internal sphincterotomy in patients with chronic anal fissure.

METHODS: a systematic review and meta-analysis of studies comparing outcomes of anal advancement flap and lateral internal sphincterotomy were conducted. The following parameters were evaluated: the rate of epithelialization, the rate of anal incontinence, and the rate of postoperative complications. The statistical analysis was carried out using the Review Manager software 5.3.

RESULTS: the systematic review included four studies that presented the results of 278 patients. Compared with LIS, the odds for healing after AAF were 63% lower (OR=0.37; CI=0.19; 0.74; P<0.005). No significant differences in the rate of postoperative complications (OR=1.43; CI=0.54; 3.78; p=0.47) were found. Compared with AAF, the odds for anal incontinence after LIS were 94% higher (OR=0.06; CI=0.01; 0.37; p=0.002).

CONCLUSION: both lateral internal sphincterotomy and anal advancement flap are effective for CAF. However, considering the ambiguity and poor quality of data from the studies comparing these procedures, a high risk of bias for comparison groups and heterogeneity of the studies, the results should be interpreted with caution. Therefore, the aforementioned limitations dictate the need for further research.

[Key words: chronic anal fissure, lateral subcutaneous sphincterotomy, anoplasty, V-Y plasty, LIS, AAF]

CONFLICTS OF INTERESTS: The authors declare no conflicts of interest.

For citation: Arslanbekova K.I., Khryukin R.Yu., Zharkov E.E. Anoplasty and lateral internal sphincterotomy for chronic anal fissure (systematic review and meta-analysis). *Koloproktologia.* 2020; v.19, no.4, pp. 115-130. https://doi.org/10.33878/2073-7556-2020-19-4-115-130

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Received – 03.08.2020 *Revised – 08.09.2020* *Accepted for publication – 09.12.2020*

INTRODUCTION

An anal fissure is an anoderm lesion located within the "anatomical" anal canal. The course of this disease can be acute and chronic. In the presence of such signs as scar edges of the lesion, fibers of the internal sphincter in its bottom, a fibrous polyp at the proximal edge of the lesion, a sentinel tag at its distal edge, as well as a history of the disease of more than 2 months indicates that the anal fissure is chronic [1-6].

Anal fissure occurs in people of the employable age, which emphasizes the social significance of the problem [7,8]. Among all coloproctological diseases, anal fissure occurs in 10-15% of cases, and the incidence is in the range of 20-23 per 1,000 people [8,9].

One of the surgical techniques most often used by coloproctologists is lateral internal sphincterotomy (LIS), which was proposed by Notaras M.J. back in 1969 [10,11]. However, the LIS technique is accompanied by a fairly high rate of postoperative anal incontinence (AI), which according to some authors reaches 45% [12-16].

In order to improve the effectiveness of treatment and minimize the risk of postoperative complications, various plastic methods for the anoderm lesion with a skin flap were proposed [17-24]. Thus, Chambers, W. et al. in 2010 showed that V-Y plastic can be successfully used as a "method of choice" in the chronic anal fissure (CAF) treatment [18]. The main advantage of V-Y plasty is that this method avoids the internal anal sphincter injury, which reduces the risk of anal incontinence. However, methods of CAF treatment using anoplasty are accompanied by a fairly high recurrence rate, reaching 22% with a follow-up period of up to 24 months [6,20,25,26].

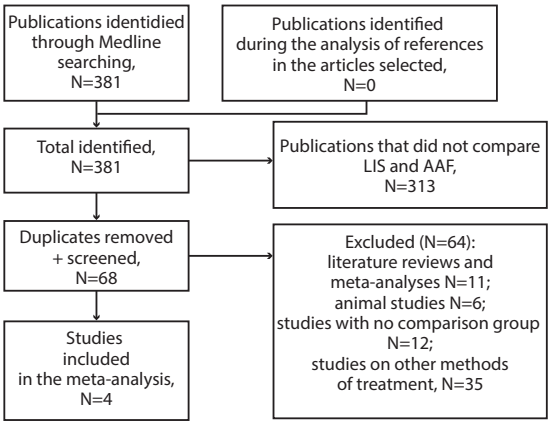


Figure 1. *Flow diagram for database search*

Most likely, the reason for the development of recurrence in the above studies is an undifferentiated approach to the selection of patients and the lack of impact on the tone of the internal sphincter with confirmed spasm.

The subject of this systematic review and meta-analysis is the summation and statistical processing of data from all available clinical studies comparing the effectiveness and safety of anoplasty and lateral internals phincterotomy in the treatment of chronic anal fissure.

MATERIALS AND METHODS

The systematic review and meta-analysis were performed in accordance with the international recommendations of the preferred reporting items for systematic reviews and meta-analyses checklist (PRISMA) [27]. The search for publications was carried out in the electronic databases of medical literature Medline and was completed in February 2020. The search query used the following keywords: "anal fissure", "fissure in ano", "advancement flap", "V–Y advancement flap", "anoplasty", "sphincterotomy" and "lateral internal sphincterotomy". The search for publications was not restricted by the date of publication of articles, and language restrictions were also not applied.

Publications included in the meta-analysis were selected according to the following criteria:

- full-text articles (randomized and non-randomized studies);
- studies comparing lateral internal sphincterotomy and anoplasty in the treatment of chronic anal fissure.

Indicators of interest:

1. Fissure epithelization rate.
2. Postoperative complications rate.
3. Postoperative anal incontinence rate.
4. Recurrence rate.

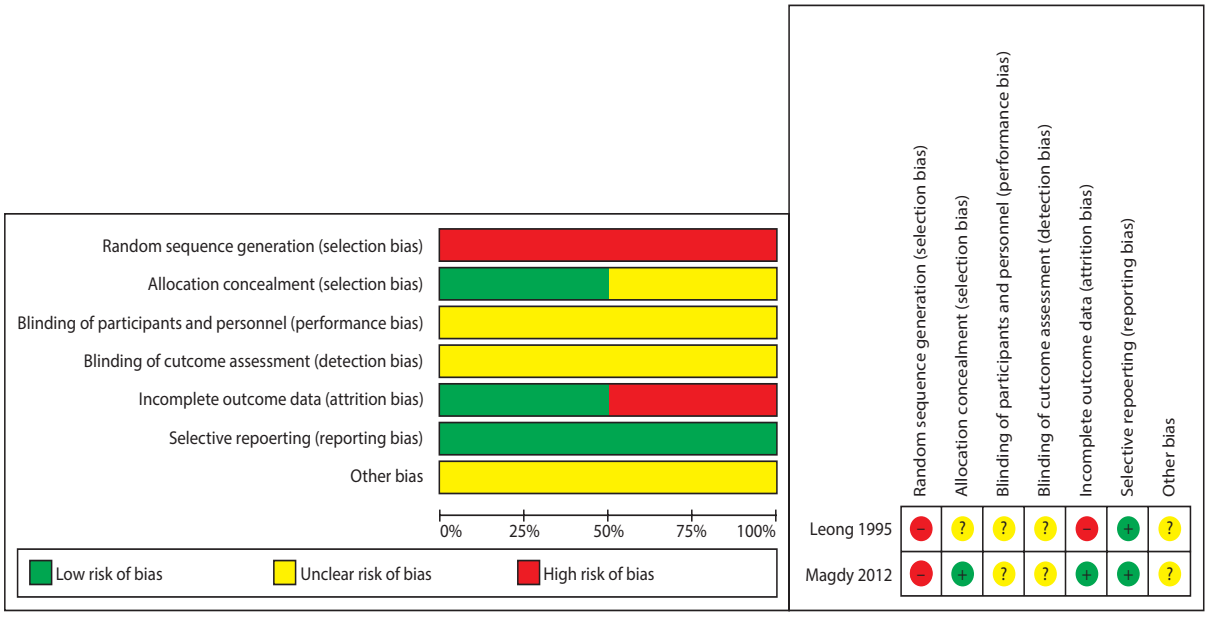


Figure 2. *A risk of bias assessment in studies comparing outcomes after LIS and anal advancement flap in patients with chronic anal fissure, according to Cochrane risk of bias checklist.*

The total value of the dichotomous indicators was represented as the odds ratio (OR) with a 95% coincidence interval (CI).
Statistical heterogeneity among the studies was assessed using the χ^2 test. Statistically significant heterogeneity was considered at $p<0.1$ and $I^2>50\%$.
Biases in the studies were evaluated graphically using a funnel graph.
The statistical analysis of data when comparing the above methods was performed using the Review Manager 5.3 software.
The quality of randomized trials was evaluated in accordance with the Cochrane risk of bias checklist [28].
The quality of non-randomized studies was assessed using the Newcastle-Ottawa (NOS) scale [29].
The maximum value of the sum of stars for each study is 9. At thelevel of 8 - 9 stars, the study has alow risk of systematic errors.

Search Results
381 publications were found in the PubMed search engine in the Medline database when compiling a query containing the above keywords.
During the subsequent literature screening, 68 articles were selected. In the future, the following were excluded:literature reviews and meta-analyses-11 articles; animal studies-6 publications; studies without a comparison group - 12 publications; studies on other methods of anal fissure treatment - 35 articles.
Thus, the analysis included 4 publications that meet the inclusion criteria, of which 2 studies are prospective randomized and 2 are retrospective (Fig.1) [3-6].
137 patients after anoplasty and 141 patients after lateral internal sphincterotomy were analyzed.
In studies evaluated according to the Cochrane risk of bias checklist, the low risk of bias of results is determined only by the study reporting criteria. In turn, the criteria of the randomization method, blinding performers and researchers, the distribution of patients into groups, and the completeness of the description of treatment results have a high risk of bias, which calls into question the quality of the studies included in the meta-analysis (Fig.2).
The characteristics and quality of studies evaluated on the NOS scale are shown in table 1.

RESULTS

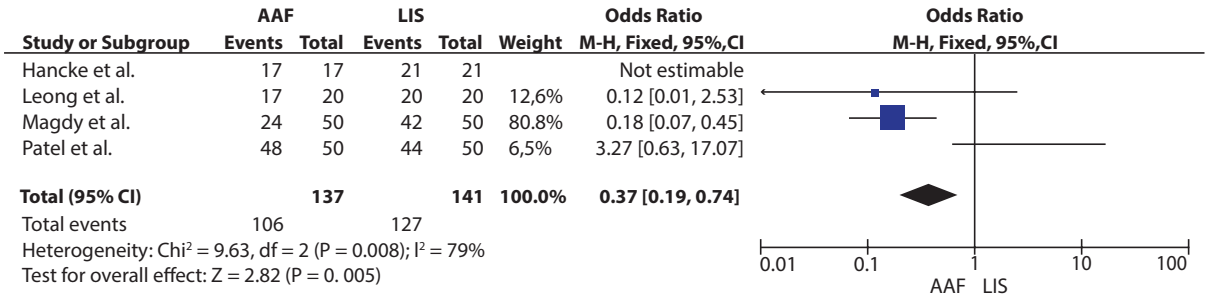
Meta-analysis of fissure epithelization rate
When analyzing the lesion healing rate demonstrated in 4 studies, it was found that after performing AP, the epithelization healing rate is 77.4% and 90.1% after performing LIS.
At the same time, the chance of postoperative wound epithelization in patients who underwent AP is 63% lower than after performing lateral internal sphincterotomy (OR=0.37; CI=0.19;0.74; p<0.005).
When assessing the homogeneity of groups in publications, it was found that there are significant biases $I^2=79$ %, p=0.008 (Fig. 3A).

Meta-analysis of Postoperative Complications
In the 4 studies presented, there were no significant differences in the postoperative complications rate after treatment of chronic anal fissure with anoplasty and lateral internal sphincterotomy (OR=1.43; CI=0.54;3.78; p=0.47).
The studies are homogeneous $I^2=1$ %, p=0.36 (Fig. 3B).

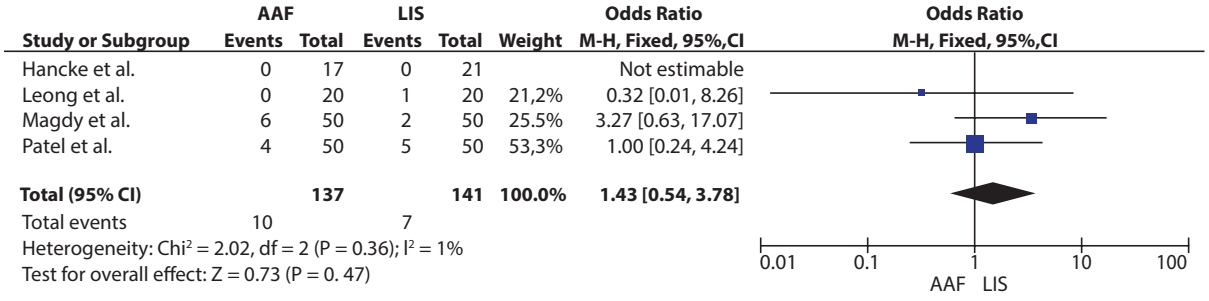
Table 1. *Characteristics of the studies comparing outcomes after anal advancement flap and lateral internal sphincterotomy in patients with chronic anal fissure*

Author	Year	Country	Study-characteristics	Follow-upperiod (months)	Proce-dure	N of patients	Postoperative wound healing, N	Compli-cations, N	Post-operative AI***, N	NOS**** for assessing the quality of studies
Magdy et al.	2012	Egypt	Blinded RCT	12	AP*	50	24	6	0	-
					LIS**	50	42	1	7	
Leong et al.	1995	Singapore	RCT	1,5	AP	20	17	0	0	-
				1,5	LIS	20	20	1	0	
Hancke et al.	2010	Germany	retrospective	88,4	AP	17	17	0	1	5
				78,5	LIS	21	21	0	10	
Patel et al.	2011	Great Britain	retrospective	8	AP	50	48	4	0	3
				9,5	LIS	50	44	4	0	

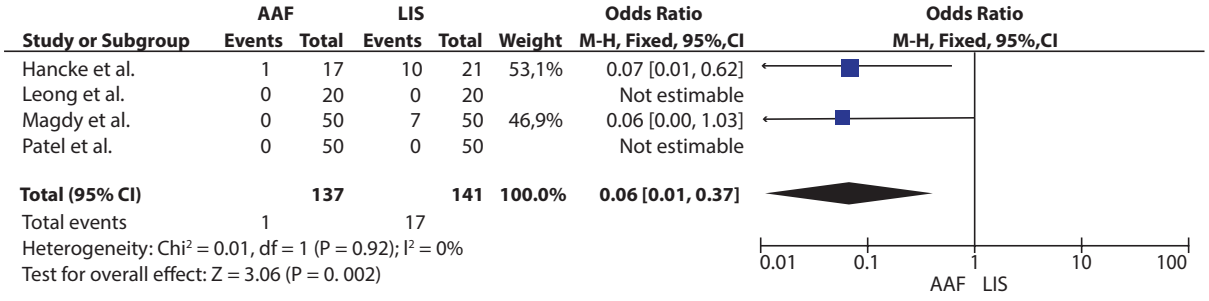
** AP – anal advancement flap.*
*** LIS – lateral internal sphincterotomy.*
**** AI – anal incontinence.*
***** NOS – The Newcastle-Ottawa Scale..*



A. Healing rates for CAF after anal advancement flap (AAF) and lateral internal sphincterotomy (LIS)



B. Complication rates for CAF after anal advancement flap (AAF) and lateral internal sphincterotomy (LIS)



B. Postoperative ASI rates for anal fissure after anal advancement flap (AAF) and lateral internal sphincterotomy (LIS)

Figure 3. *Anal advancement flap versus lateral internal sphincterotomy for chronic anal fissure*

Meta-analysis of Development of Postoperative Anal Sphincter Incontinence

When analyzing data on the postoperative AI rate presented in the 4 studies, it was found that the AI rate after AP is 0.7% and after LIS is 12%.

At the same time, the chance of developing AI is 94% higher after lateral internal sphincterotomy than after anoplasty (OR=0.06; CI=0.01;0.37; p=0.002).

The studies are homogeneous I^2=0%, p=0.92 (Fig. 3B).

DISCUSSION

In the presented meta-analysis, the effectiveness and safety of the classical surgical method for treatment of chronic anal fissure - lateral internal sphincterotomy and an alternative technique of anoplasty were assessed.

According to a number of authors, the fissure epithelization rate using the anoplasty technique ranges from 86% to 100% [3,4,18-20,30], and after lateral internal sphincterotomy – 84% - 100% [3-6,34,35]. However, when comparing thelesion healing rate, in the studies included in the meta-analysis, it was found that after anoplasty, the chance of postoperative wounds healing is 63% lower than after lateral internal sphincterotomy.

Complications after using the above methods were represented by ischemia and flap retraction, wound infection, and bleeding. No significant differences in the postoperative complications rate after using the compared methods were found.

A number of authors, who compare lateral internal sphincterotomy with other surgeries for CAF, such as botulinum toxin injection into the internal anal sphincter and balloon dilation, have agreed that all the above-mentioned surgeries are comparable in the postoperative complications rate [8,31-33].

The risk of anal incontinence after AP and LIS was assessed.

With a follow-up period of 1.5 to 88.4 months, the postoperative anal incontinence rate is 94% higher after treatment of a chronic anal fissure using lateral internal sphincterotomy than after anoplasty.

Thus, when studying the risk of developing postoperative AI, Ebinger, S. M. et al. in 2017 in their network meta-analysis, comparing various surgical methods for CAF treatment, showed that the anal incontinence rate after LIS was 9.4%, after botulinum toxin injection - 4.1%, balloon dilation - 18.2%, and after anoplasty - 4.9%, with follow-up periods from 2 weeks to 5 years [33].

Of all the studies included in the meta-analysis, the data on the risk of recurrence in both groups were only provided by Magdy, A. and co-authors, where the recurrence rate after anoplasty was 22%, and after LIS - 4%, with a follow-up period of 12 months [6].

According to theliterature, the risk of recurrence after lateral internal sphincterotomy with follow-up periods of up to 20 months reaches 20% [6,34,35], and after anoplasty with follow-up periods of up to 24 months - 22% [6,20,25,26]. In turn, Patti R. and co-authors in 2012 showed that fissure excision in combination with anoplasty is a safe and effective surgical technique, postoperative wounds were epithelized in all patients [26].

When comparing the studied treatment methods, it was found that the use of anoplasty reduces the risk of postoperative AI, but at the same time it is inferior to lateral internal sphincterotomy in the epithelialization rate [3-6]. However, the above results should be interpreted with caution, since when assessing the quality of studies included in the meta-analysis, there is a high risk of bias of their results due to insufficient sample size and heterogeneity of groups, as well as different follow-up periods for patients.

It is worth noting that the study by Magdy A. and co-authors included a group of patients who underwent VY-plastic surgery in combination with posterior dosed sphincterotomy, where the lesion healing rate was 94%, and the risk of AI and recurrence was 2% each, with a follow-up period of 12 months [6].

However, among the various methods of sphincterotomy to eliminate the internal sphincter spasm, the most optimal is lateral internal sphincterotomy [36].

In turn, Patti R. and co-authors in 2010 conducted a pilot study in which patients with CAF underwent excision of the anal fissure in combination with anoplasty and drug relaxation of the internal sphincter with botulinum toxin.

In all the patients, the postoperative wound healed by 30th day after surgery, and the anal incontinence rate was 10% during the follow-up period of up to 12 months [19].

Given the fact that an important role in the etiology and pathogenesis of anal fissure belongs to the internal sphincter spasm [8,37], it is safe to say that success in the above-mentioned studies was achieved due to the elimination of anal sphincter hypertonus.

Thus, we believe that VY-plastic surgery in combination with fissure excision and medical relaxation of the internal sphincter will have an advantage over other surgical techniques for CAF treatment.

CONCLUSION

Currently, there is no unified concept in choosing a surgical method for the treatment of chronic anal fissure, and most authors agree that it should definitely be combined [3,4,6,8,19,24,37,38].

According to the meta-analysis, lateral internal sphincterotomy shows a higher lesion epithelization rate.

At the same time, the results of treatment of patients after anoplasty indicate a lower risk of developing postoperative anal incontinence.

However, the low and ambiguous quality indicators of studies comparing AP and LIS, the high risk of bias in the results in the compared groups, as well as the

heterogeneity of publications, make it necessary to approach the interpretation of the obtained data with caution and dictate the need for further research on comparing fissure excision in combination with VY-plasty and drug relaxation of the internal sphincter with botulinum toxin type A with fissure excision in combination with lateral internal sphincterotomy.

THE PARTICIPATION OF THE AUTHORS:

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Collection and processing of the material: *Arslanbekova K.I., Khryukin R.Yu., Zharkov E.E.*
Statistical processing: *Arslanbekova K.I., Khryukin R.Yu., Zharkov E.E.*
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