Tech Coloproctol (2016) 20:299–307
DOI 10.1007/s10151-016-1458-y

ORIGINAL ARTICLE

Tailored therapy for different presentations of chronic pain after stapled hemorrhoidopexy

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Received: 4 July 2013 / Accepted: 11 July 2015 / Published online: 1 April 2016

Abstract
Background As stapled hemorrhoidopexy (SH) becomes more widely used, we see more patients with chronic postoperative anal pain after this surgery. Its presentation is variable and difficult to treat. The aim of our study was to investigate the impact of chronic anal pain after SH and whether tailored therapy was likely to achieve a favorable outcome.
Methods We retrospectively analyzed 31 consecutive patients with chronic anal pain who had undergone SH in other hospitals and were referred to our institutions. Depending on the type of pain, unrelated (at rest) or related to defecation, two groups of patients were identified. Moreover, the mean distance of the staple line from the anal verge was calculated in both groups. Treatments included: topical nifedipine, local anesthetic and steroid infiltration, removal of retained staples, anal dilation, and scar excision with mucosal suturing. A visual analog scale (VAS) was used to compare pain at baseline, postoperatively, and in the follow-up. This mean difference of the VAS score between stages was always used as the main outcome measure, depending on the type of presentation, type of pain, and type of treatment. Treatment response was defined as a 50 % decrease of VAS from baseline.
Results There were 22 males and 9 females. The overall median age was 43 years (range 21–62 years). On digital examination and proctoscopy, 15 (48 %) patients had inflammatory changes, 19 (61 %) patients had staple retention, 8 (26 %) patients had anorectal stenosis, and 30 (97 %) patients had scar tissue. All patients had one or more of the following treatments listed from the least to most invasive: topical nifedipine in 12 (39 %) patients, anal dilation in 6 (19 %) patients, anesthetic and steroid infiltration in 18 (58 %) patients, removal of staples in 10 (32 %) patients, and scar excision in 18 (58 %) patients. The mean VAS score at baseline was 6.100, ± 1.953 SD, which dropped significantly after treatment to 1.733, ± 1.658 SD ($p < 0.001$) and remained low at follow-up (1.741 ± SD 1.251; $p < 0.743$). In patients with pain at rest ($n = 20$, 65 %), the symptoms improved in 19 (95 %) patients, while the VAS score decreased from 5.552 ± 2.115 SD to 1.457 ± 1.440 SD (95 % CI 3.217–4.964; $p < 0.001$). In patients with post-evacuation pain ($n = 11$, 35 %), the symptoms improved in 11 (100 %) patients, while the VAS score decreased from 6.429 ± 1.835 SD to 1.891 ± 1.792 SD (95 % CI 3.784–5.269; $p < 0.001$). Rating of response based on presentation was 90.0 % (0.9/10) after treatment of staple retention, which led to a significant decrease in the mean VAS score from 6.304 ± 1.845 SD to 1.782 ± 1.731 SD (95 % CI 3.859–5.185; $p < 0.001$). Anal stenosis was successfully treated in 100.0 % ($n = 8/8$) of cases with the mean VAS score dropping from 6.500 ± 1.309 SD to 2.125 ± 1.808 SD

This article is based on data presented as a poster at the Fifth European Society of Coloproctology (ESCP) Meeting, Sorrento, Italy, September 22–25, 2010.

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(95 % CI 2.831–5.919; $p < 0.001$). Anal inflammation improved in 60.0 % ($n = 9/15$) of patients and the mean VAS score dropped from 6.006 ± 2.138 SD to 1.542 ± 1.457 SD (95 % CI 3.217–4.964; $p < 0.001$). The response after scar tissue treatment was 94 % ($n = 17/18$) of patients with a mean VAS decreasing from 6.117 ± 2.006 SD to 1.712 ± 1.697 SD (95 % CI 3.812–4.974; $p < 0.001$). Success for topical nifedipine was between 13 and 25 % of patients depending on the clinical presentation. Anal dilation was successful in 75 % of patients, while Anesthetic and steroid infiltration in 23–54 % of patients depending on the clinical presentation. Staple removal was successful in 77 % of patients, and scar excision with mucosal suturing in 94 % of patients.

Conclusions Our retrospective study suggests that most patients with chronic anal pain after SH may be cured with treatment by applying a stepwise approach from the least to the most invasive treatment.

Keywords Stapled hemorrhoidopexy · Chronic postoperative pain · Visual analog scale · Suture line · Scar tissue · Anal inflammation · Anal stenosis · Staple retention

Introduction

Stapled hemorrhoidopexy (SH) is a well-established method for treating hemorrhoids. It has gained popularity over the last decade, mainly due to reports of a possible reduction in the postoperative pain. In fact, trials and recent systematic reviews have demonstrated a consistent advantage in terms of pain reduction and early recovery compared with conventional hemorrhoidectomy [1–5]. Despite these good results, frequently patients may complain of a chronic anal pain after SH, which has been well documented in the literature [6–11]. Chronic anal pain is likely to be sharp and not completely responsive to painkillers; some reports have described resultant opioid dependency, which impaired the patient's quality of life [12]. Cheetham et al. [13] based their paper on a national multicenter analysis, which clearly describes the clinical presentation of chronic anal pain after SH.

Nevertheless, we could not find any study regarding the mechanism underlying chronic anal pain after SH other than vague hypotheses about possible causes, for instance descriptions of pain due to a very low staple line that was easily recognizable [14].

Therefore, the principles of treatment are often focused on symptoms and difficulties in controlling this tenacious pain remain a cause for concern.

The primary endpoint of this study was to investigate which clinical presentation was related to chronic anal pain. A secondary endpoint was to establish whether a tailored treatment could be effective in achieving a favorable outcome.

Materials and methods

Between 2006 and 2008, 31 consecutive patients who had been previously treated with SH in other surgical units were referred to 2 centers for evaluation of chronic anal pain (Proctology Unit, Department of Surgery, University Hospital of Geneva, Switzerland, and Asola Surgery Unit, Department of Surgery and Orthopaedics, Carlo Poma Hospital, Mantua, Italy).

Patients with anal pain that developed immediately during their postoperative course, lasted more than 6 months, and was unresponsive to painkillers, dietary modification, and laxatives were included in our study. Patients with chronic anal pain who had undergone surgical procedures other than SH such as stapled transanal rectal resection (STARR) were excluded.

We identified 2 groups of patients depending on the type of pain: patients with pain at rest, that was unrelated to defecation, and patients with post-evacuatory pain that was associated with defecation.

In addition, we measured the distance from the anastomotic staple line to the anal verge in all patients to establish whether staple location might affect either pain at rest or post-evacuatory pain.

The severity of pain was assessed by means of a visual analog scale (VAS) in which 0 corresponded to "no pain" and 10 to "maximum pain" [15]. This allowed us to compare symptom relief at baseline and post-treatment.

Follow-up was carried out to assess the outcome of each patient, depending on the type of treatment, focusing on the VAS score and scheduling checkups every 3 months (during the first year) and every 6 months thereafter. The minimum length of follow-up was set at 24 months. Considering that the last patient was enrolled at the end of the year 2008, the median follow-up was 34 months (range 25–47 months).

The clinical presentation of chronic anal pain included anal inflammation, staple retention, anal stenosis, and scar tissue found on physical examination and endoscopy. Anal inflammation was identified as anal involvement under the staple line demonstrating venous congestion with signs of mucosal hyperemia and a translucent blue-coloured mucosa. Staple retention was the presence of appreciable or outcropping staples in the suture line with or without granulomas. Anal stenosis was identified by a reduced lumen at the level of the staple line. This condition is defined as the loss of the capacity to dilate with passage of feces depending on chronic local inflammation [16]. In our series, this feature was also well documented in all cases by a proctogram to complete the clinical assessment. Further

X-ray exams were not performed. Scar tissue was defined as the presence of redundant fibrosis all around the staple line without significant reduction in the lumen. In these patients, the digital rectal exam was painful.

Depending on the type of prior condition(s) reported, a therapeutic strategy was chosen. If that failed to relieve the pain, another treatment was planned, beginning with the least invasive.

Four different types of interventions were carried out alone or in combination, starting from the least invasive: (1) topical nifedipine: nifedipine 0.3 % and lidocaine 1.5 % ointment, twice/day for 3–4 weeks, Antrolin (Bracco s.p.a., Milan, Italy); (2) anal dilation: twice/day for 5 min for 1 month, using Dilatan® 18–23 mm. (Sapimed Alessandria, Italy); (3) local anesthetic and steroid infiltration: using ropivacaine hydrochloride (Naropin, AstraZeneca, London, UK), 7.5 mg, 10 ml diluted in 20 ml normal saline solution, mixed with betamethasone (Celestone, Schering Plough, Kenilworth, NJ, USA), 1 mg, diluted in 20 ml normal saline solution every 4 weeks, up to three infiltrations; (4) removal of retained staples. This procedure was undertaken with or without anesthesia depending on the depth of staple retention. (5) Rectal scar excision with mucosal flap. This intervention required general or spinal anesthesia to fully relax the internal sphincter and consisted of a full excision of the scar, underlying mucosa and submucosa of the rectal wall and flap suturing of the defect with absorbable stitches (Figs. 1, 2).

The outcome assessment was focused on symptom relief from chronic anal pain. We calculated the difference between the VAS score at baseline and post-treatment, at day 30, based on the type of presentation, type of pain, and type of treatment. This difference was used in all patients to categorize favorable outcomes. Therefore, considering established cutoff points [17, 18], we defined "response," as an improvement of at least 50 % of symptoms represented by a 50 % or more decrease in the VAS score.

Moreover, the mean distance of the suture line from the anal verge was measured to determine whether it could impact post-treatment VAS, based on the type of pain and response. A univariate analysis was conducted to assess the impact of each variable.

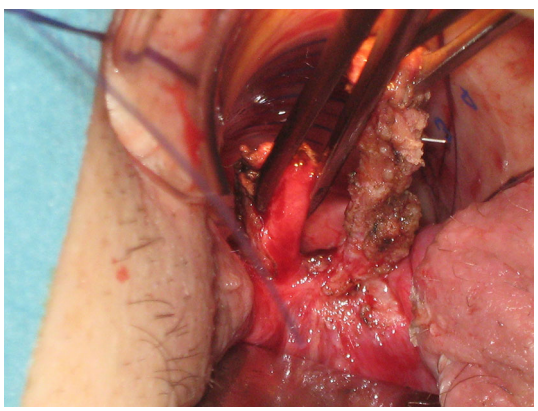

Fig. 1 Intraoperative view of scar tissue excision

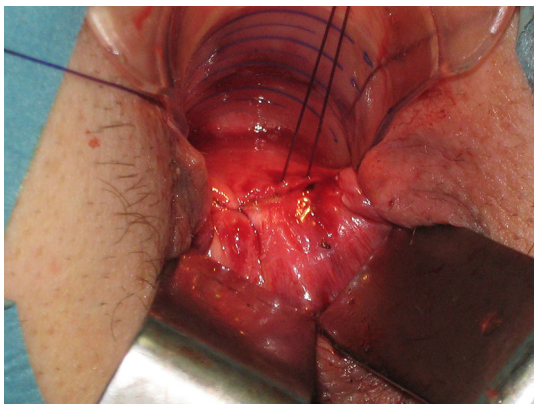

Fig. 2 Final appearance of flap suturing

Before starting any therapy, all patients gave written informed consent. Given the retrospective design of the study, institutional review board approval was not required.

Follow-up examinations were carried out every 3 months (during the first year) and every 6 months thereafter. The difference between post-treatment VAS scores and follow-up VAS scores at 24 months was assessed.

Statistical analysis

Data were presented as the mean ± standard deviation (SD), median, range, or percentage. Statistical comparisons for continuous variables with covariates were performed with the analysis of covariance (ANCOVA), while comparisons of the VAS score between stages (baseline, and post-treatment) were performed using the paired Student's *t* test, with a confidence interval (CI) of 95 %.

Linear regression analysis was used for showing the relationship between staple distance from the anal verge and post-treatment VAS score, type of pain, and response. To accomplish this, Cohen's scale of effect size was used. It considers a value of 0.2 = small, 0.5 = moderate, and 0.8 = large, provided that the dimension of effect size is independent from different unit measures. Significance was expressed at a p value <0.05. Statistical analysis was performed using IBM SPSS version 22.0 (IBM Corp. Released 2013. Statistics for Windows, Armonk, NY, USA).

Results

The minimum length of follow-up was set at 24 months. Considering that the last patient was enrolled at the end of the year 2008, the median follow-up was 34 months (range 25–47 months).

Table 1 Demographics, list of associated conditions, combined treatments and VAS score

Pt	Age	Sex	Presentation	Type of pain groups	Distance (cm) from AV of stapler line	Type of treatment	VAS baseline	VAS post-op.	VAS 24 months
1	31	M	SR, SC	1	5	Local infiltration, staple removal, scar excision	8	4	1
2	35	F	AI, SR, SC	2	10	Topical nifedipine, staple removal	4	0	0
3	50	F	AI, SC	2	10	Topical nifedipine	3	1	1
4	32	F	AI, SR, SC	2	9	Topical nifedipine	5	2	2
5	41	M	SR, AS, SC	1	5	Local infiltration, anal dilation, staples removal, scar excision	7	2	2
6	40	M	AI, SR, SC	1	6	Local infiltration, scar excision	8	1	2
7	54	M	AI, SC	1	5	Local infiltration	4	0	0
8	51	M	SR, SC	2	4	Topical nifedipine, staple removal	6	3	3
9	62	M	SR, SC	1	6	Local infiltration, scar excision	7	3	3
10	37	F	AI, SR, SC	2	9	Topical nifedipine, staple removal	6	0	1
11	35	M	AR, SC	1	4	Local infiltration	6	0	0
12	32	M	SC	1	5	Local infiltration, scar excision	9	4	4
13	49	M	SR, AS, SC	1	4	Local infiltration, anal dilation, rectal excision	6	6	5
14	50	M	AI, SR, SC	1	5	Scar excision	9	4	4
15	36	M	SR, SC	1	6	Local infiltration, scar excision	5	1	1
16	46	F	AI, SR, SC	2	9	Topical nifedipine, scar excision	9	4	5
17	60	M	AI, SR, SC	1	3	Local infiltration, staple removal	2	0	0
18	28	F	AI, AS, SC	2	12	Local infiltration, scar excision	7	2	2
19	42	M	AI, SR, AS, SC	1	4	Staple removal, anal dilation, scar excision	7	2	2
20	28	M	SR, AS, SC	1	7	Local infiltration, anal dilation, scar excision	5	0	0
21	21	M	SR, SC	1	6	Local infiltration, scar excision	8	2	2
22	55	M	SC	2	5	Topical nifedipine	3	0	0
23	52	F	SR, AS, SC	1	8	Local infiltration, anal dilation, scar excision	6	1	2
24	44	F	SR, AS, SC	2	7	Local infiltration, anal dilation, scar excision	9	3	3
25	34	M	AI, SC	1	6	Topical nifedipine, local infiltration, scar excision	7	3	3
26	48	F	AI, SR, SC	1	6	Topical nifedipine, local infiltration	6	0	0
27	44	M	AR, SC	2	8	Local infiltration, staple removal	4	0	0
28	43	M	AI, SR, SC	1	5	Topical nifedipine, staple removal, scar excision	8	3	3
29	52	M	AR, SC	1	6	Topical nifedipine, staple removal	4	0	0
30	49	M	AI, AS	2	5	Topical nifedipine	5	1	1
31	38	M	SC	1	5	Local infiltration, scar excision	8	2	2

AI anal inflammation, *SR* staple retention, *AS* anorectal stenosis, *SC* scar tissue, *Group 1* pain at rest, *Group 2* post-evacuatory pain, *AV* anal verge, *VAS* visual analog scale, *Pt* patient

Between 2006 and 2008, 31 patients were enrolled in our study. Table 1 summarizes the demographics, associated conditions, type of pain, treatments, and VAS score at base line, postoperatively and in the 24-month follow-up.

The study population included 22 males and 9 females with an overall median age of 43 years (range 21–62 years).

The clinical presentation was anal inflammation in 15 (48. %) patients, retained staples in 19 (61 %) patients, anorectal stenosis in 8 (26 %) patients, and scar tissue in 30 (97 %) patients. Concomitant symptoms were present in 28 (90 %) patients.

In terms of treatment, 12 (39 %) patients received topical nifedipine which was the sole treatment in 5 (42 %). Six (19 %) patients underwent anal dilation, which was always preceded by other treatments. Eighteen (59 %) patients received local anesthetic and steroid infiltration, which was the sole treatment in 3 (17 %) cases, while in 15 (83 %) cases it was associated with supplementary

Table 2 Predominant presentations in patients with pain at rest and with post-evacuatory pain

Presentation	Pain at rest (20 patients)		Post-evacuatory pain (11 patients)	
	n	%	*n*	%
Anal inflammation	8	53	7	47
Staple retention	14	74	5	26
Anal stenosis	6	75	2	25
Scar tissue	20	67	10	33

n number

Table 3 Types of procedures adopted in patients with pain at rest and with post-evacuatory pain

Type of therapy	At rest (20 patients)		Post-evacuatory (11 patients)	
	n	%	*n*	%
Topical nifedipine	3	25	9	75
Anal dilation	5	83	1	17
Anaesthetic, steroid infiltration	15	83	3	17
Staple removal	4	44	5	56
Scar excision, mucosal suturing	15	83	3	17

n number

treatment. Ten (32 %) patients underwent removal of retained staples, which was always preceded by other treatments. Eighteen (59 %) patients underwent rectal excision with mucosal suturing, which was the sole treatment in 1 (5 %) patient, while in the others it was always performed as a second-line therapy.

At evaluation upon admission, the average distance from the anastomotic staple line to the anal verge was 6.3 cm (± 2.156 SD).

We determined the rates of each presentation depending on the type of pain and found that retained staples, anal stenosis, and scar tissue prevailed in patients with pain at rest (74, 75 and 67 %, respectively; Table 2). Table 3 summarizes the rates of each procedure based on the type of anal pain. Local anesthetic and steroid infiltration, anal dilation, and rectal excision with mucosal suturing were predominantly carried out in patients with pain at rest, while application of topical nifedipine and removal of retained staples were more frequently performed in patients with post-evacuatory pain. The clinical outcomes following treatment are shown in Fig. 3.

We undertook a stepwise approach according to each presentation in those patients who did not respond. Specifically, topical nifedipine was always used as the first-line therapy, but its effectiveness was limited because it required an additional therapeutic line. Topical nifedipine resulted in a response in only 2 (13 %) patients out of 15 with anal inflammation, in 2 (25 %) patients out of 8 with anal stenosis, in 3 (16 %) patients out of 19 with retained staples, and in 5 (17 %) patients out of 30 with scar tissue.

Anal dilation was successfully used as second-line therapy in 6 (100 %) patients with anorectal stenosis.

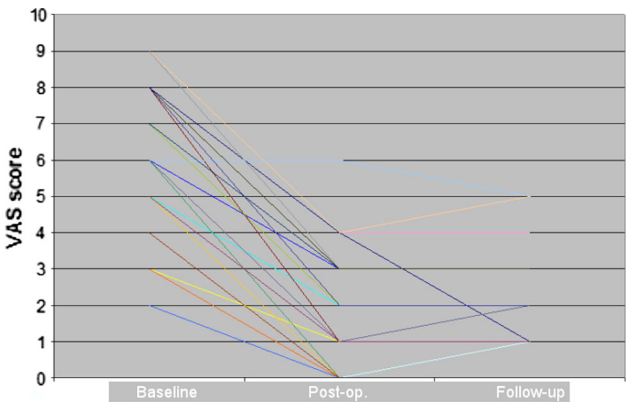

Fig. 3 Trend of VAS score comparing baseline, post-treatment and follow-up

Local anesthetic and steroid infiltration was effective, as first-line therapy, in 7 (23 %) patients, out of 30, with scar tissue, while it was effectively used as a second-line therapy, in 8 (61 %) patients out of 15 with anal inflammation, and in 6 (37 %) patients out of 16 with retained staples. Finally, this treatment was successfully repeated as a third-line therapy in 3 (60 %) patients with anal inflammation, although they had not previously responded.

Removal of retained staples was used in 9 (90 %) patients out of 10 with retained staples as a third-line therapy when other treatments failed (16 cases, out of 19, following topical nifedipine and 10 cases, out of 16, following anesthetic and steroid infiltration).

Scar excision and mucosal suturing (flap) was effective, as a second-line therapy, in 17 (94 %) patients, out of 18, with scar tissue. It was not effective in 1 (6 %) patient.

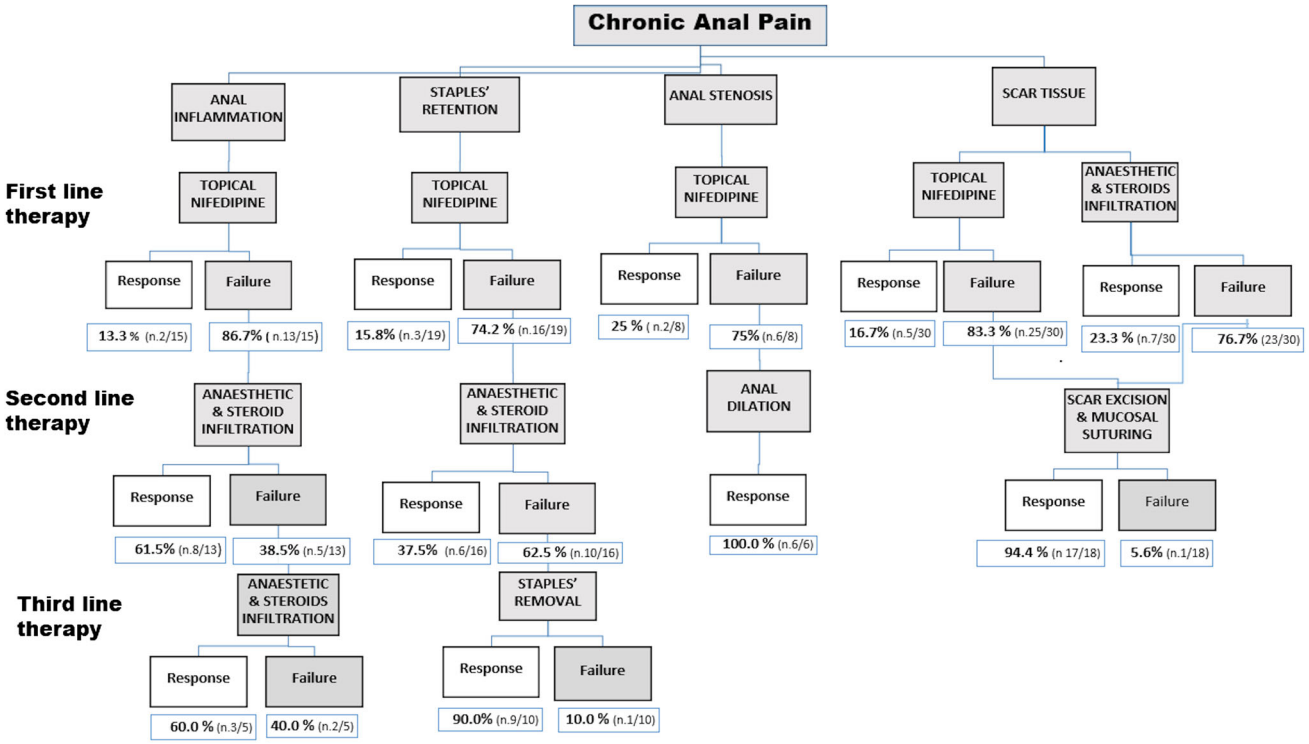

Fig. 4 Suggested therapeutic algorithm, including the rates of favorable outcome according to each treatment

The rectal excision specimens showed signs of anal inflammation in the form of the usual poly-morphonuclear leukocyte infiltration and increased transitional epithelium in 6 cases (out of 18). In 2 specimens, both columnar and transitional mucosa was found. Interestingly, in 7 cases (out of 18) possible nerve trunk edema and proliferation of small nerve fibers in a fibrotic submucosal area were described, although these findings were not part of a significant neuronal alteration and thus not pathological.

Figure 4 summarizes the rates of response or failure of each treatment.

Outcomes

The comprehensive results of the univariate analysis, including the values of SD, 95 % CI, and size effects, are displayed in Table 4.

We found that all presentations experienced effective symptom relief in as shown by a significant reduction in VAS scores post-treatment. Scar excision was successfully employed in the majority of cases ($n = 17/18$, 94 %) with scar tissue. Among all treatments, staple removal ($n = 9/10$, 90 %) demonstrated the largest size effect ($d = 5.04$). Finally, according to the linear regression analysis, we found that the mean distance of the staple line from the anal verge was not related to the post-treatment VAS, the type of pain, or the response to treatment. Table 5 displays the results of this analysis in detail, including all tested values.

Discussion

Literature data show that the incidence of chronic anal pain following SH ranges from 1.6 to 31 % [15, 19–25]. Although the extent of this complication is limited compared with those described for conventional hemorrhoidectomy, the onset of chronic anal pain is a cause for concern. Surgeons who deal with such complications are aware of the challenge of determining the proper treatment, as different causative factors can influence it. However, they have not yet been fully investigated, and treatments to relieve symptoms have not been validated.

One may assume that a low staple line, involving the sensitive neural fibers and squamous epithelium, would be the principal determinant of chronic anal pain [26]. However, our review of the literature demonstrates that a properly placed suture line does not reduce the risk of chronic anal pain [13, 21, 27, 28]. Moreover, a pathological audit on a large series of consecutive rectal mucosal specimens investigated the role of squamous epithelium

Table 4 Univariate analysis calculating differences between mean VAS scores at baseline and postoperatively, depending on presentation, type of pain and treatment

Variable	Pts (*n*)	Baseline mean VAS	±SD	Post-treatment mean VAS	±SD	Difference	95 % CI	*t*	*p*	*d*
Presentation										
Anal inflammation	15	6.006	2.138	1.542	1.457	4.09	3.217–4.964	12.291	<0.001	3.17
Anal stenosis	8	6.500	1.309	2.125	1.808	4.375	2.831–5.919	6.700	<0.001	2.93
Staples' retention	19	6.304	1.845	1.782	1.831	4.522	3.859–5.185	14.141	<0.001	2.94
Scar tissue	30	6.117	2.006	1.712	1.697	4.405	3.812–4.974	15.506	<0.001	3.11
Type of pain										
At rest	20	5.552	2.115	1.457	1.440	4.095	3.217–4.964	10.434	<0.001	3.15
Post-evacuatory	11	6.429	1.835	1.891	1.792	4.538	3.784–5.269	12.804	<0.001	2.94
Treatment										
Topical nifedipine										
Yes	12	5.50	1.883	1.42	1.505	4.08	3.295–4.871	11.406	<0.001	3.29
No	19	6.50	1.948	1.94	1.765	4.56	3.770–5.341	12.232	<0.001	
Anal dilation										
Yes	6	6.501	1.309	2.131	1.808	4.370	2.831–5.919	6.700	<0.001	2.36
No	25	5.952	2.149	1.591	1.623	4.361	3.774–4.953	15.401	<0.001	
Anesthetic and steroid infiltration										
Yes	18	6.569	1.590	1.818	1.797	4.751	3.913–5.587	12.098	<0.001	3.02
No	13	5.576	2.243	1.646	1.550	3.930	3.232–4.625	12.182	<0.001	
Staple removal										
Yes	9	6.000	1.658	1.560	1.590	4.440	3.767–5.122	15.119	<0.001	5.04
No	22	6.144	2.104	1.810	1.721	4.330	3.581–5.086	12.011	<0.001	
Scar excision, mucosal suturing										
Yes	18	7.353	1.320	2.653	1.498	4.700	3.962–5.450	13.403	<0.001	3.25
No	13	4.468	1.330	0.547	0.967	3.921	3.088–4.758	10.234	<0.001	

VAS visual analog scale, *Pts* patients, *n* number, *SD* standard deviation, *CI* confidence interval, *d* sized effect

present in the pathology specimens but did not find any significant difference between symptoms or Cleveland Clinic scores in patients with or without the presence of squamous epithelium [29].

Another study described that stratified squamous mucosa or part of the internal anal sphincter was found in a significant proportion of rectal mucosa specimens, suggesting that this technique may result in damage to the patient's internal anal sphincter [30].

As more SH procedures have been performed over the years, the number of reports of chronic anal pain after SH continued to rise. As a result, while some surgeons still use the procedure, others now perform it less frequently or not at all. Overall, we believe that there is no reason to completely abandon SH. Some colorectal surgeons persist in using stapled transanal rectal resection (STARR) to treat rectal prolapse. This procedure is similar to SH, but the clinical impact is different; more severe complications are associated with the procedure, often the result of STARR being performed for improper indications.

In our approach to chronic anal pain following SH, we had the chance to assess and manage these patients from a more objective point of view. Our cohort consisted only of patients who suffered from chronic anal pain because of surgery, which was always performed in another center, and these patients refused to be referred to the original surgical department again. This allowed us to behave as inter-observers in understanding and classifying chronic anal pain. Our attention was focused first, on which presentations were prevalent and second on ascertaining their role in triggering pain.

By dividing the patients according to 2 major types of pain, pain at rest, and post-evacuatory pain, we were able to better target the cause of pain.

By comparing the treatments that were chosen depending on the type of pain, we mainly found that in patients

Table 5 Linear regression analysis investigating the relationship between the distance of the suture line from the anal verge and variables (post-treatment VAS, type of pain, and response)

	Y	R^2	95 % CI of the slope	*p*
Post-treatment VAS	2.596–0.136	0.031	−0.430 to 0.157	0.350
Type of pain				
At rest	1.713–0.032	0.003	−0.468 to 0.403	0.871
Post-evacuatory	3.711–0.338	0.048	−1.785 to 4.983	0.366
Response (VAS score difference)	3.787–0.092	0.019	−0.166 to 0.350	0.473

VAS visual analog scale, *CI* confidence interval

with pain at rest, local anesthetic infiltration, and scar excision with mucosal suturing prevailed as first- and second-line therapy, respectively. We must also mention that the outcomes after local anesthetic infiltration for treating scar tissue were poor, and patients later required scar excision.

We determined that the level of the staple line in patients with post-evacuatory pain was higher than in patients with pain at rest. Moreover, we found a subset of 3 patients among those with post-evacuatory pain who had a suture line 10 cm above the anal verge, suggesting that this anomalous condition favors impaired rectal distention during evacuation, thus eliciting pain at that moment. This change in rectal sensitivity might be seen as a form of obstructed defecation. This fact contradicts reports on the negative role played by a lower suture line in the onset of chronic anal pain [19].

We found a high rate of retained staples. It is possible that the presence of staples triggers chronic anal pain and that deeply embedded staples provoke more pain that is intolerable. Unfortunately, as Petersen et al. [31] reported it, treatment by removal of retained staples alone has only low-level evidence for its ability to relieve chronic anal pain.

In our study, removal of retained staples was simply performed in a limited number of cases but was third-line therapy after previous treatments had failed. A report by Wunderlich et al. addresses removal of staples (also defined as agraffectomy), excision of the staple line and the manual refashioning of the anastomosis. The paper advocates the effective role of this procedure; however, it does not specify whether scar tissue was present or not when the method was applied [32].

Topical nifedipine was the most common treatment chosen in cases of post-evacuatory pain. This is consistent with some studies that have demonstrated the effectiveness of nifedipine administered either topically [33] or orally [34]. Scar excision with mucosal suturing was carried out in 3 patients who were unresponsive to topical nifedipine. Local anesthetic infiltration and scar excision with mucosal suturing were the main therapies used in cases of pain at rest. Local anesthetic infiltration was the early approach, but its effectiveness was poor. Thus, scar excision was chosen as the subsequent procedure, aiming to remove the protruding scar tissue. Using the same line of reasoning, and considering the higher rate of scar tissue in patients with pain at rest, we can state that this type of pain was likely influenced by the lower placement of the suture line.

A large number of patients with scar tissue were observed in our cohort, and scar excision with mucosal suturing was always performed. This procedure resulted in a high rate of successful outcomes in terms of symptoms relief, when there was a poor response to previous treatments using systemic anti-inflammatory drugs as well as local anesthetic infiltration. The value of scar excision in terms of optimal response has been recently confirmed, which corroborates our findings [35]. Furthermore, we must ask whether there are recognizable pathophysiological patterns that give rise to chronic anal pain. There is no clear answer to this question because both single and multiple aspects of the histological findings described cannot fully explain it. We suspect that there are neurological disorders (e.g., neuroma like lesions) inside the scar, but in our series we were not able to prove this histologically.

Because the patients experienced considerable pain relief after scar excision, our hypothesis is that it is a useful treatment in cases of chronic anal pain following SH, although our study is limited by the small size of the cohort.

Treatments should be combined and performed in a stepwise manner to be effective. The treatment schedule should be clearly explained to the patient after the type of pain (at rest or post-evacuatory), and the prevalent clinical presentation have been accurately diagnosed. This makes the approach to treating these patients clearer and easy to carry out for both the surgeon and the patient.

Conclusions

We achieved good results in patients with chronic anal pain after SH by using our treatment algorithm. Redundant fibrosis around the staple line appears to be a key causative factor of this complication of SH Scar excision with mucosal suturing (flap) seems to be an effective treatment method. Further studies on this subject are needed.

Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

Ethical approval No specific ethics committee approval was required to our institutional review board given the absence of disease-specific protocols in proctology, related to chronic anal pain treatment.

Informed consent Before starting any therapy, all patients gave written specific informed consent.

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