OPINION REVIEW

Whipple’s operation with a modified centralization concept: A model in low-volume Caribbean centers
Cawich SO, Pearce NW, Naraynsingh V, Shukla P, Deshpande RR

REVIEW

Role of micronutrients in Alzheimer’s disease: Review of available evidence
Fei HX, Qian CF, Wu XM, Wei YH, Huang JY, Wei LH

MINIREVIEWS

Application of imaging techniques in pancreaticobiliary maljunction
Wang JY, Mu PY, Xu YK, Bai YY, Shen DH

Update on gut microbiota in gastrointestinal diseases
Nishida A, Nishino K, Ohno M, Sakai K, Owaki Y, Noda Y, Imaeda H

Vascular complications of pancreatitis
Kalas MA, Leon M, Chavez LO, Canalizo E, Surani S

ORIGINAL ARTICLE

Clinical and Translational Research

Network pharmacology and molecular docking reveal zedoary turmeric-trisomes in Inflammatory bowel disease with intestinal fibrosis
Zheng L, Ji YY, Dai YC, Wen XL, Wu SC

Case Control Study

Comprehensive proteomic signature and identification of CDKN2A as a promising prognostic biomarker and therapeutic target of colorectal cancer
Wang QQ, Zhou YC, Zhou GE YJ, Qin G, Yin TF, Zhao DY, Tan C, Yao SK

Retrospective Cohort Study

Is anoplasty superior to scar revision surgery for post-hemorrhoidectomy anal stenosis? Six years of experience
Weng YT, Chu KJ, Lin KH, Chang CK, Kang JC, Chen CY, Hu JM, Pu TW

Retrospective Study

Short- (30-90 days) and mid-term (1-3 years) outcomes and prognostic factors of patients with esophageal cancer undergoing surgical treatments
Shi MK, Mei YQ, Shi JL
Contents

7720 Effectiveness of pulsed radiofrequency on the medial cervical branches for cervical facet joint pain
Chang MC, Yang S

7728 Clinical performance evaluation of O-Ring Halcyon Linac: A real-world study

7738 Correlation between the warning symptoms and prognosis of cardiac arrest
Zheng K, Bai Y, Zhai QR, Du LF, Ge HX, Wang GX, Ma QB

7749 Serum ferritin levels in children with attention deficit hyperactivity disorder and tic disorder
Tang CY, Wen F

7760 Application of metagenomic next-generation sequencing in the diagnosis of infectious diseases of the central nervous system after empirical treatment
Chen YY, Guo Y, Xue XH, Pang F

7772 Prognostic role of multiple abnormal genes in non-small-cell lung cancer

7785 Prospective single-center feasible study of innovative autorelease bile duct supporter to delay adverse events after endoscopic papillectomy

Clinical Trials Study

7794 Performance of Dexcom G5 and FreeStyle Libre sensors tested simultaneously in people with type 1 or 2 diabetes and advanced chronic kidney disease
Ólafsdóttir AF, Andelin M, Saeed A, Sofizadeh S, Hamoodi H, Jansson PA, Lind M

Observational Study

7808 Complications of chronic pancreatitis prior to and following surgical treatment: A proposal for classification
Murruste M, Kirsinägi Ü, Kase K, Veršinina T, Talving P, Lepner U

7825 Effects of comprehensive nursing on postoperative complications, mental status and quality of life in patients with glioma
Dong H, Zhang XL, Deng CX, Luo B

Prospective Study

7832 Predictors of long-term anxiety and depression in discharged COVID-19 patients: A follow-up study
Boyraz RK, Şahan E, Boylu ME, Korponar İ

META-ANALYSIS

7844 Same-day single-dose vs large-volume split-dose regimens of polyethylene glycol for bowel preparation: A systematic review and meta-analysis
### Contents

**Thrice Monthly Volume 10 Number 22 August 6, 2022**

<table>
<thead>
<tr>
<th>Page</th>
<th>Title</th>
<th>Authors</th>
</tr>
</thead>
<tbody>
<tr>
<td>7859</td>
<td>Rectal nonsteroidal anti-inflammatory drugs, glyceryl trinitrate, or combinations for prophylaxis of post-endoscopic retrograde cholangiopancreatography pancreatitis: A network meta-analysis</td>
<td>Shi QQ, Huang GX, Li W, Yang JR, Ning XY</td>
</tr>
<tr>
<td>7872</td>
<td>Effect of celecoxib on improving depression: A systematic review and meta-analysis</td>
<td>Wang Z, Wu Q, Wang Q</td>
</tr>
</tbody>
</table>

#### CASE REPORT

<table>
<thead>
<tr>
<th>Page</th>
<th>Title</th>
<th>Authors</th>
</tr>
</thead>
<tbody>
<tr>
<td>7883</td>
<td>Rectal mature teratoma: A case report</td>
<td>Liu JL, Sun PL</td>
</tr>
<tr>
<td>7890</td>
<td>Antibiotic and glucocorticoid-induced recapitulated hematological remission in acute myeloid leukemia: A case report and review of literature</td>
<td>Sun XY, Yang XD, Yang XQ, Ju B, Xiu NN, Xu J, Zhao XC</td>
</tr>
<tr>
<td>7899</td>
<td>Non-secretory multiple myeloma expressed as multiple extramedullary plasmacytoma with an endobronchial lesion mimicking metastatic cancer: A case report</td>
<td>Lee SB, Park CY, Lee HJ, Hong R, Kim WS, Park SG</td>
</tr>
<tr>
<td>7906</td>
<td>Latamoxef-induced severe thrombocytopenia during the treatment of pulmonary infection: A case report</td>
<td>Zhang RY, Zhang JJ, Li JM, Xu YY, Xu YH, Cai XJ</td>
</tr>
<tr>
<td>7913</td>
<td>Multicentric reticulohistiocytosis with prominent skin lesions and arthritis: A case report</td>
<td>Xu XL, Liang XH, Liu J, Deng X, Zhang L, Wang ZG</td>
</tr>
<tr>
<td>7931</td>
<td>Primary hypertension in a postoperative paraganglioma patient: A case report</td>
<td>Wei JH, Yan HL</td>
</tr>
<tr>
<td>7936</td>
<td>Long-term survival of gastric mixed neuroendocrine-non-neuroendocrine neoplasm: Two case reports</td>
<td>Woo LT, Ding YF, Mao CY, Qian J, Zhang XM, Xu N</td>
</tr>
<tr>
<td>7944</td>
<td>Percutaneous transfemoral endoscopic decompression combined with percutaneous vertebroplasty in treatment of lumbar vertebral body metastases: A case report</td>
<td>Ran Q, Li T, Kaung ZP, Guo XH</td>
</tr>
<tr>
<td>7950</td>
<td>Atypical imaging features of the primary spinal cord glioblastoma: A case report</td>
<td>Liang XY, Chen YP, Li Q, Zhou ZW</td>
</tr>
<tr>
<td>7960</td>
<td>Resection with limb salvage in an Asian male adolescent with Ewing’s sarcoma: A case report</td>
<td>Lai CY, Chen KJ, Ho TY, Li LY, Kuo CC, Chen HT, Fong YC</td>
</tr>
</tbody>
</table>
Contents

Thrice Monthly Volume 10 Number 22 August 6, 2022

7973  Delayed arterial symptomatic epidural hematoma on the 14th day after posterior lumbar interbody fusion: A case report
Hao SS, Gao ZF, Li HK, Liu S, Dong SL, Chen HL, Zhang ZF

7982  Clinical and genetic analysis of nonketotic hyperglycinemia: A case report
Ning JJ, Li F, Li SQ

7989  Ectopic Cushing's syndrome in a patient with metastatic Merkel cell carcinoma: A case report
Ishay A, Touma E, Vornicova O, Dodik-Gad R, Goldman T, Bisharat N

7994  Occurrence of MYD88L265P and CD79B mutations in diffuse large b cell lymphoma with bone marrow infiltration: A case report
Huang WY, Weng ZY

8003  Rare case of compartment syndrome provoked by inhalation of polyurethane agent: A case report
Choi JH, Oh HM, Hwang JH, Kim KS, Lee SY

8009  Acute ischemic Stroke combined with Stanford type A aortic dissection: A case report and literature review
He ZY, Yao LP, Wang XK, Chen NY, Zhao JJ, Zhou Q, Yang XF

8018  Compound-honeysuckle-induced drug eruption with special manifestations: A case report
Zhou LF, Lu R

8025  Spontaneous internal carotid artery pseudoaneurysm complicated with ischemic stroke in a young man: A case report and review of literature
Zhong YL, Feng JP, Luo H, Gong XH, Wei ZH

8034  Microcystic adnexal carcinoma misdiagnosed as a “recurrent epidermal cyst”: A case report
Yang SX, Mou Y, Wang S, Hu X, Li FQ

8040  Accidental discovery of appendiceal carcinoma during gynecological surgery: A case report
Wang L, Dong Y, Chen YH, Wang YN, Sun L

8045  Intra-ampullary papillary-tubular neoplasm combined with ampullary neuroendocrine carcinoma: A case report
Zavrtanik H, Lucar B, Tomažič A

LETTER TO THE EDITOR

8054  Commentary on "Primary orbital monophasic synovial sarcoma with calcification: A case report"
Tokur O, Aydin S, Karavas E
World Journal of Clinical Cases

Contents

ABOUT COVER
Editorial Board Member of World Journal of Clinical Cases, Bennete Aloysius Fernandes, MDS, Professor, Faculty of Dentistry, SEGi University, Kota Damansara 47810, Selangor, Malaysia. drben17@yahoo.com

AIMS AND SCOPE
The primary aim of World Journal of Clinical Cases (WJCC, World J Clin Cases) is to provide scholars and readers from various fields of clinical medicine with a platform to publish high-quality clinical research articles and communicate their research findings online.

WJCC mainly publishes articles reporting research results and findings obtained in the field of clinical medicine and covering a wide range of topics, including case control studies, retrospective cohort studies, retrospective studies, clinical trials studies, observational studies, prospective studies, randomized controlled trials, randomized clinical trials, systematic reviews, meta-analysis, and case reports.

INDEXING/ABSTRACTING
The WJCC is now abstracted and indexed in Science Citation Index Expanded (SCIE, also known as SciSearch®), Journal Citation Reports/Science Edition, Current Contents®/Clinical Medicine, PubMed, PubMed Central, Scopus, Reference Citation Analysis, China National Knowledge Infrastructure, China Science and Technology Journal Database, and Star Journals Database. The 2022 Edition of Journal Citation Reports® cites the 2021 impact factor (IF) for WJCC as 1.534; IF without journal self cites: 1.491; 5-year IF: 1.599; Journal CiteScore Indicator: 0.28; Ranking: 135 among 172 journals in medicine, general and internal; and Quartile category: Q4. The WJCC’s CiteScore for 2021 is 1.2 and Scopus CiteScore rank 2021: General Medicine is 443/826.

RESPONSIBLE EDITORS FOR THIS ISSUE
Production Editor: Xu Guo; Production Department Director: Xiang La; Editorial Office Director: Jin-Lei Wang.

NAME OF JOURNAL
World Journal of Clinical Cases

ISSN
ISSN 2307-8960 (online)

LAUNCH DATE
April 16, 2013

FREQUENCY
Thrice Monthly

EDITORS-IN-CHIEF
Bao-Gan Peng, Jerzy Tadeusz Chudek, George Kontogeorgos, Maurizio Serati, Ja Hyeon Ku

EDITORIAL BOARD MEMBERS
https://www.wjgnet.com/2307-8960/editorialboard.htm

PUBLICATION DATE
August 6, 2022

COPYRIGHT
© 2022 Baishideng Publishing Group Inc

INSTRUCTIONS TO AUTHORS
https://www.wjgnet.com/bpg/gerinfo/204

GUIDELINES FOR ETHICS DOCUMENTS
https://www.wjgnet.com/bpg/gerinfo/287

GUIDELINES FOR NON-NATIVE SPEAKERS OF ENGLISH
https://www.wjgnet.com/bpg/gerinfo/240

PUBLICATION ETHICS
https://www.wjgnet.com/bpg/gerinfo/288

PUBLICATION MISCONDUCT
https://www.wjgnet.com/bpg/gerinfo/208

ARTICLE PROCESSING CHARGE
https://www.wjgnet.com/bpg/gerinfo/242

STEPS FOR SUBMITTING MANUSCRIPTS
https://www.wjgnet.com/bpg/gerinfo/239

ONLINE SUBMISSION
https://www.f6publishing.com
Is anoplasty superior to scar revision surgery for post-hemorrhoidectomy anal stenosis? Six years of experience

Yu-Tse Weng, Kuan-Jung Chu, Kuan-Hsun Lin, Chun-Kai Chang, Jung-Cheng Kang, Chao-Yang Chen, Je-Ming Hu, Ta-Wei Pu

Abstract

BACKGROUND
Anal stenosis is a rare but frustrating condition that usually occurs as a complication of hemorrhoidectomy. The severity of anal stenosis can be classified into three categories: mild, moderate, and severe. There are two main surgical treatments for this condition: scar revision surgery and anoplasty; however, no studies have compared these two approaches, and it remains unclear which is preferable for stenoses of different severities.

AIM
To compare the outcomes of scar revision surgery and double diamond-shaped flap anoplasty.
INTRODUCTION

Anal stenosis is defined as the narrowing of the anal canal due to contraction of the epithelial lining[1, 2]. The normal anoderm is replaced with an inelastic fibrotic tissue, which renders the anal canal abnormally tight and non-pliable[3]. It is a rare but frustrating circumstance that commonly occurs as a complication of hemorrhoidectomy or other anorectal surgical procedure[4-6]. Anal stenosis may also develop due to inflammatory bowel disease, trauma, chronic laxative abuse, venereal disease, and local radiation therapy[7-10]. It is estimated that approximately 90% of anal stenoses are sequelae of hemorrhoidectomies[11-13]. Patients may have symptoms such as decreasing stool caliber, difficult defecation, bleeding, fecal incontinence, incomplete evacuation, anal pain, and/or diarrhea[4,11,14,15]. The severity of anal stenosis is classified into three degrees: mild, moderate, and severe. These are determined based on an anal examination with a Hill-Ferguson retractor or index-small finger[11,16]. For mild stenosis, conservative management methods such as fiber supplements, stool softeners, or bulk-forming agents are usually suggested; Periodical digital or mechanical anal dilations, as well as sphincterotomy, may also be performed[12,17]. For moderate-to-severe stenosis, a surgical approach is indicated[18,19], with the two main surgical methods being scar revision surgery and anoplasty. The former method involves excision of the scar tissue and suturing the wound, whereas the latter uses local flaps to excise the cicatrized tissue, dissect the stricture, and increase the anal canal size to lessen the severity of stenosis.

RESULTS

We analyzed 60 consecutive patients, including 36 men (60%) and 24 women (40%). The mean operative time for scar revision surgery was significantly shorter than that for double diamond-shaped flap anoplasty (10.14 ± 2.31 [range: 7-15] min vs 21.62 ± 4.68 [range: 15-31] min; P < 0.001). The average of length of hospital stay was also significantly shorter after scar revision surgery than after anoplasty (2.1 ± 0.3 vs 2.9 ± 0.4 d; P < 0.001). Postoperative satisfaction was categorized into four groups: 45 patients (75%) reported excellent satisfaction (scores of 8-10), 13 (21.7%) reported good satisfaction (scores of 6-7), two (3.3%) had no change in satisfaction (scores of 3-5), and none (0%) had scores indicating poor satisfaction (1-2). As such, most patients were satisfied with their quality of life after surgery other than the two who noticed no difference due owing to the fact that they experienced recurrences.

CONCLUSION

Scar revision surgery may be preferable for mild anal stenosis upon conservative treatment failure. Anoplasty is unavoidable for moderate or severe stenosis, where cicatrized tissue is extensive.

Key Words: Anal canal; Anoplasty; Scar revision; Stenosis; Surgery-induced tissue adhesions; Surgical flaps

©The Author(s) 2022. Published by Baishideng Publishing Group Inc. All rights reserved.

Core Tip: The severity of anal stenosis can be classified into three categories: mild, moderate, and severe. According to our study, we drew an algorithm for the management of anal stenosis based on severity. For mild anal stenosis, scar revision surgery can be attempted first if nonsurgical methods fail, with anoplasty performed if recurrence occurs. For moderate and severe anal stenosis, opting for anoplasty from the outset is the best option to prevent subsequent surgeries.

Citation: Weng YT, Chu KJ, Lin KH, Chang CK, Kang JC, Chen CY, Hu JM, Pu TW. Is anoplasty superior to scar revision surgery for post-hemorrhoidectomy anal stenosis? Six years of experience. World J Clin Cases 2022; 10(22): 7698-7707

URL: https://www.wjgnet.com/2307-8960/full/v10/i22/7698.htm
DOI: https://dx.doi.org/10.12998/wjcc.v10.i22.7698
severity of symptoms and recover normal anal function[20,21]. Ideally, the selected procedure should be simple to perform and be well-tolerated, with a low complication rate and good long-term results without recurrence. However, there are no studies comparing the two aforementioned surgical approaches, and it remains unclear whether the choice of procedure depends on the severity of the stenosis. Therefore, we performed this retrospective study to compare patients who underwent scar revision surgery to those who underwent anoplasty over a six-year period.

**MATERIALS AND METHODS**

**Patients**
This retrospective cohort analysis included patients who were treated between January 2010 and December 2015 for mild-to-severe anal stenosis and who underwent scar revision surgery or double diamond-shaped flap at the Department of Surgery, Taiwan Adventist Hospital, Taipei, Taiwan (Figure 1). We included patients who were diagnosed with anal stenosis post-hemorrhoidectomy. Patients with this condition owing to other causes such as inflammatory bowel disease, tuberculosis, trauma, previous radiation therapy, and previous anal malignancy were excluded from the study, as were those who were lost to follow-up. Ultimately, 60 patients who fulfilled the selection criteria were included in the analysis.

**Preoperative management**
Preoperative evaluation included clinical and proctologic examinations. The following variables were collected during the clinical examination: age; sex; the preoperative severity of anal stenosis, symptoms, and adjuvant therapy. A proctologic examination was performed digitally or using a Hill-Ferguson retractor to determine the severity of the stenosis. All the patients had first attempted conservative management methods but were unsuccessful, thereby necessitating surgical intervention to ameliorate their discomfort. All data were inputted into an electronic database.

**Surgical technique**
Full bowel preparation was performed preoperatively, and the same team performed all surgical procedures for all the patients. Scar revision surgery or double diamond-shaped flap was chosen according to the surgeon’s experiences and preference. We performed these two procedures under intravenous general anesthesia; moreover, a single dose of intravenous antibiotics (cefazolin) was administered upon the induction of anesthesia as a prophylactic against wound infection. The patients were placed in the jackknife position, and the skin was sterilized and draped per standard protocol. For scar revision surgery, the scar was commonly found in the 3, 7, and 11 o’clock directions. We removed the scar with a longitudinal incision through the stricture while controlling bleeding with wet epinephrine tape. The wound was closed with a 3-0 catgut (transverse closure) and covered with gauze (Figure 2A). For the double diamond-shaped flap anoplasty, a diamond-shaped flap from the adjacent perianal skin was delineated and dissected together on both sides. The dissection was generally performed deep into the fascia to create a well-perfused, tension-free flap transposed into the anal canal. The flap was then introduced into the anal canal defect for wound coverage (Figures 2B and 3).

**Postoperative follow-up**
Before discharge, the operative time, length of hospital stay, and postoperative complications were recorded. The patients underwent scheduled clinical and proctologic examinations at the outpatient clinic 1, 2, and 4 wk after surgery. Subsequently, regular inspections were performed upon patient request. Patients were contacted by telephone after 6 mo and were invited to the outpatient clinic for a final follow-up evaluation. During their postoperative workups, the patients underwent clinical and proctologic evaluations during which the following variables were collected: postoperative symptoms, postoperative adjuvant therapy, recurrence, and postoperative quality of life. Recurrence was defined as experiencing symptoms of anal stenosis that could not relieved by conservative treatment. The patients’ postoperative quality of life was assessed using a satisfaction questionnaire that comprised a 10-point rating scale ranging from 1 (poor) to 10 (excellent). The satisfaction scores were grouped into four categories: excellent (8-10), good (6-7), same (3-5), and poor (1-2).

**Statistical analysis**
The patients’ characteristics are summarized as total numbers, percentages, and means ± standard deviations. Student’s t-test for paired samples was used to detect differences in the means of continuous variables over time. Statistical significance was set at a P-value < 0.05. The SPSS software for Windows, version 22.0 (IBM Corp., Armonk, NY, United States) was used to perform the statistical analyses.
Approval and consent

The study protocol was reviewed and approved by the institutional review board of our hospital (approval No. 111-E-01). All procedures were performed under the ethical standards of the institutional research committee and those of the 1964 Helsinki Declaration and its later amendments, or comparable ethical standards. The requirement for informed consent was waived by the institutional review board of our hospital due to the retrospective nature of the study, and patient information was anonymized and de-identified prior to analysis.

RESULTS

The patients’ demographic data and characteristics are presented in Table 1. Thirty-six men (60%) and 24 women (40%) with anal stenosis underwent scar revision surgery or double diamond-shaped flap anoplasty between January 1, 2010 and December 31, 2015. Among them, 8 with moderate or severe anal stenosis had previously undergone scar revision surgery, but underwent diamond-shaped flap anoplasty owing to recurrence; these individuals were categorized into the diamond-shaped flap anoplasty group. The median patient age was 54.65 ± 12.65 years (range: 27-76 years). All patients had strained defecation; other symptoms are shown in Table 1. All
Table 1 Demographic characteristics of patients who underwent surgery for hemorrhoidectomy-associated anal stenosis

<table>
<thead>
<tr>
<th></th>
<th>Scar revision surgery</th>
<th>Double diamond-shaped flap anoplasty</th>
<th>P value</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient numbers</td>
<td>21 (35%)</td>
<td>39 (65%)</td>
<td></td>
<td>60</td>
</tr>
<tr>
<td>Age (yr)</td>
<td>54 ± 14.5</td>
<td>55 ± 11.8</td>
<td>0.773</td>
<td>54.65 ±12.65</td>
</tr>
<tr>
<td>Sex (male/female)</td>
<td>13/8 (61.9%/38.09%)</td>
<td>23/16 (58.97%/41.03%)</td>
<td>0.825</td>
<td>36/24 (60%/40%)</td>
</tr>
<tr>
<td>Preoperative severity of anal stenosis</td>
<td></td>
<td></td>
<td>&lt; 0.001</td>
<td></td>
</tr>
<tr>
<td>Mild</td>
<td>17 (80.95%)</td>
<td>12 (30.77%)</td>
<td></td>
<td>29 (48.33%)</td>
</tr>
<tr>
<td>Moderate</td>
<td>4 (19.05%)</td>
<td>16 (41.03%)</td>
<td></td>
<td>20 (33.33%)</td>
</tr>
<tr>
<td>Severe</td>
<td>0</td>
<td>11 (28.21%)</td>
<td></td>
<td>11 (18.33%)</td>
</tr>
<tr>
<td>Preoperative symptoms</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Strained defecation</td>
<td>21 (100%)</td>
<td>39 (100%)</td>
<td>-</td>
<td>60 (100%)</td>
</tr>
<tr>
<td>Incomplete evacuation</td>
<td>13 (61.9%)</td>
<td>26 (66.67%)</td>
<td>0.712</td>
<td>39 (65%)</td>
</tr>
<tr>
<td>Painful evacuation</td>
<td>4 (19.04%)</td>
<td>25 (64.1%)</td>
<td>0.001</td>
<td>29 (48.33%)</td>
</tr>
<tr>
<td>Defecation bleeding</td>
<td>0</td>
<td>8 (20.51%)</td>
<td>0.026</td>
<td>8 (13.33%)</td>
</tr>
<tr>
<td>Incontinence</td>
<td>0</td>
<td>7 (17.95%)</td>
<td>0.039</td>
<td>7 (11.67%)</td>
</tr>
<tr>
<td>Adjuvant therapy</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Laxative medication</td>
<td>21 (100%)</td>
<td>39 (100%)</td>
<td>-</td>
<td>60 (100%)</td>
</tr>
<tr>
<td>Pain control medication</td>
<td>4 (19.05%)</td>
<td>25 (64.1%)</td>
<td>0.001</td>
<td>29 (48.33%)</td>
</tr>
<tr>
<td>Digital dilatation</td>
<td>7 (33.33%)</td>
<td>17 (43.59%)</td>
<td>0.439</td>
<td>24 (40%)</td>
</tr>
</tbody>
</table>

Figure 3 Double diamond-shaped flap anoplasty. A: Intraoperative double diamond-shaped flap design; B: Postoperative double diamond-shaped flap.

patients had previously tried conservative management, and all were administered laxatives, while smaller proportions attempted other additional treatments. Ultimately, 21 patients (35%) underwent scar revision surgery while 39 (65%) underwent double diamond-shaped flap anoplasty.

The perioperative results are shown in Table 2. The mean operative times for scar revision surgery was significantly shorter for that for double diamond-shaped flap anoplasty (10.14 ± 2.31 [range: 7-15] min vs 21.62 ± 4.68 [range: 15-31] min; P < 0.001). The average of length of hospital stay was also significantly shorter in the former group (2.1 ± 0.3 d) than in the latter (2.9 ± 0.4 d; P < 0.001). Four patients in the double diamond-shaped flap group underwent urinary catheterization because of urinary retention, but the difference in this complication between the two groups was not significant (P = 0.129). None of the patients in our study experienced wound dehiscence, wound infection, postoperative fever, or postoperative bleeding.

Finally, we investigated the postoperative conditions of the patients after 6 mo (Table 3). Two patients of moderate anal stenosis in the scar revision surgery group had strained defecation and one had incomplete evacuation; these were considered recurrence. None of the patients in the anoplasty group...
Table 2 Surgical outcomes of patients treated surgically for anal stenosis

<table>
<thead>
<tr>
<th>Patient numbers</th>
<th>21 (35%)</th>
<th>39 (65%)</th>
<th>60</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operative time (min)</td>
<td>10.14 ± 2.31</td>
<td>21.62 ± 4.68</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Length of hospital stay (d)</td>
<td>2.1 ± 0.3</td>
<td>2.9 ± 0.4</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Complications</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acute urinary retention</td>
<td>0</td>
<td>4 (10.3%)</td>
<td>-</td>
</tr>
<tr>
<td>Wound dehiscence</td>
<td>0</td>
<td>0</td>
<td>0.129</td>
</tr>
<tr>
<td>Wound infection</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Postoperative fever</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Postoperative bleeding</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

Table 3 Postoperative 6-mo follow-up

<table>
<thead>
<tr>
<th>Scar revision surgery</th>
<th>Double-diamond-shaped flap anoplasty</th>
<th>P value</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient numbers</td>
<td>21 (35%)</td>
<td>39 (65%)</td>
<td></td>
</tr>
<tr>
<td>Postoperative symptoms</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Strained defecation</td>
<td>2 (9.52%)</td>
<td>0</td>
<td>0.05</td>
</tr>
<tr>
<td>Incomplete evacuation</td>
<td>1 (4.76%)</td>
<td>0</td>
<td>0.169</td>
</tr>
<tr>
<td>Painful evacuation</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Defecation bleeding</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Incontinence</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Adjuvant therapy</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Laxative medication</td>
<td>2 (9.52%)</td>
<td>0</td>
<td>-</td>
</tr>
<tr>
<td>Pain control medication</td>
<td>0</td>
<td>0</td>
<td>0.05</td>
</tr>
<tr>
<td>Digital dilatation</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Recurrence</td>
<td>2 (9.52%)</td>
<td>0</td>
<td>0.05</td>
</tr>
<tr>
<td>Quality of life</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Poor (1–2)</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Same (3–5)</td>
<td>2 (9.52%)</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Good (6–7)</td>
<td>6 (28.57%)</td>
<td>7 (17.95%)</td>
<td></td>
</tr>
<tr>
<td>Excellent (8–10)</td>
<td>13 (61.90%)</td>
<td>32 (82.05%)</td>
<td></td>
</tr>
</tbody>
</table>

had any postoperative symptoms or required adjuvant therapy (i.e., there were no recurrences in this group). On their postoperative satisfaction questionnaires, 45 patients (75%) reported excellent satisfaction scores, whereas 13 (21.7%) and 2 (3.3%) reported good satisfaction and no change, respectively; the latter two were those who experienced recurrences. Importantly, there were a significant difference in satisfaction between the two groups (P = 0.035), with more satisfaction in double diamond-shaped flap anoplasty group.

DISCUSSION

Anal stenosis is not uncommon after anal surgery; its rate has been reported to range from 1.2% to 10% in patients who have undergone hemorrhoidectomy[22]. As mentioned in the Introduction, there are numerous causes of anoderm tissue scarring that can lead to anal stenosis or stricture. Mild anal stenosis is defined as a stenotic anal canal that can still be examined using a well-lubricated index finger or medium-size Hill-Ferguson retractor[11]. Most patients with mild anal stenosis can be managed nonsurgically using methods such as increasing fiber-rich food in the diet or using stool softening or bulk-forming agents[11,23]. Daily gentle self-digital or instrumental dilation with Hegar dilators can also be
Weng et al. Scar revision vs anoplasty for anal stenosis

Weng et al. Scar revision vs anoplasty for anal stenosis

Digital dilatation is a much simpler method and avoid the costs of Hegar dilators; however, patients may unintentionally injure the anal sphincter, resulting in further fibrosis and stricture and ultimately more serious stenosis[4,24]. Therefore, Hegar dilators used by surgeons while patients are under adequate anesthesia are a safer choice. Casadesus et al[3] described 4 patients who achieved satisfactory results with regular progressive self-dilatation using Hegar dilators. If conservative management fails, scar revision surgery ought to be the first choice; this simpler procedure can often achieve satisfactory outcomes and produce fewer complications. Scar revision surgery involved only the excision of the fibrotic tissue and suturing of the wound, causing less trauma to the anoderm and thus risks fewer postoperative complications than anoplasty. Most of our patients with mild anal stenosis in whom conservative treatment failed were satisfied with scar revision surgery, and had none complications or recurrences. Anoplasty is only indicated if scar revision surgery fails.

Moderate anal stenosis is defined as the ability of a lubricated index finger or medium-sized Hill-Ferguson retractor to penetrate the anus[1]. As in patients with moderate stenosis, conservative management is not adequate for patients with severe stenosis. Moreover, scar revision surgery is not feasible owing to extensive cicatrized tissue. Therefore, we immediately opted for anoplasty for these patients. Anoplasty consists of excising the fibrotic tissue, dissecting the stricture, and increasing the dimension of the anal outlet using proximal or distal local flap advancement to restore normal anal function[20,21,25]. In our study, all patients with severe anal stenosis who underwent double diamond flap anoplasty achieved good outcomes; their postoperative quality of life improved significantly, and none required adjuvant therapy or experienced recurrence.

There are numerous procedures described in the literature regarding anoplasty for anal stenosis, and the choice of the surgery depends on the surgeon’s experience as well as the severity of the stricture[6,12,17,26]. No single procedure is superior to others, and it is difficult to evaluate the outcomes of the various techniques owing to the lack of adequate prospective trials[12]. We selected the double diamond flap anoplasty technique because of its good long-term results and low complication rates, as well as our departmental experience with this procedure. Moreover, this method is performed on both sides of the anus simultaneously, which can ameliorate the stenosis remarkably. After the anoplasty procedure, the postoperative quality of life improved greatly, and none of the patients required adjuvant therapy or experienced recurrences.

However, we found that the length of hospital stay was significantly longer in the double diamond flap anoplasty group than in the scar revision surgery group. Given that the anoplasty produced a larger operative wound, it is likely that more pain control medication is required in this group. The number of postoperative complications associated with urinary retention was also higher in the anoplasty group, even though this group experienced better performance than the scar revision surgery group in terms of quality of life improvement, recurrence rate, and the need for postoperative adjuvant therapy.

Based on our experience, we developed an algorithm for selecting the appropriate anal stenosis management methods according to severity (Figure 4). According to this algorithm, conservative management should considered first for mild anal stenosis; if non-operative approaches fail, scar revision surgery can then be performed. A simpler procedure can often achieve satisfactory outcomes and produce fewer complications. If the patient experiences recurrence after scar revision surgery, anoplasty is indicated. For patients with moderate or severe anal stenosis, conservative management or scar revision surgery may not be adequate first choices; rather, directly opting for anoplasty may be the best way to achieve satisfactory outcomes and avoid secondary operations.

There are some limitations in our study. First, some biases were inevitable because of the retrospective and single-hospital nature of this study. Second, it was small sample size because most of the patients with anal stenosis did not need surgical intervention, which were excluded in advance. Third, information on important confounders for the associated risks (e.g., smoking habits, consumption of alcohol, dietary patterns, type 2 diabetes mellitus, hypertension, and many other comorbidities) were not well-recorded. Finally, it was a retrospective cohort analysis. Further large-scale prospective studies are needed to investigate these results.
**CONCLUSION**

Anal stenosis can be managed effectively, with the optimal method based on the condition’s severity. For mild anal stenosis, scar revision surgery can be attempted first if nonsurgical methods fail, with anoplasty performed if recurrence occurs. For moderate and severe anal stenosis, opting for anoplasty from the outset is the best option to prevent subsequent surgeries.

**ARTICLE HIGHLIGHTS**

*Research background*
There are two main surgical treatments for anal stenosis: scar revision surgery and anoplasty. There were no studies comparing these two approaches, and it remains unclear which is preferrable for stenoses of different severities, including mild, moderate, and severe.

*Research motivation*
To compare the outcomes of scar revision surgery and double diamond-shaped flap anoplasty for anal stenosis.

*Research objectives*
To analyze which surgery have benefit to different severity of anal stenosis.

*Research methods*
Patients with anal stenosis following hemorrhoidectomy procedures who were treated with either scar revision surgery or double diamond-shaped flap anoplasty at our institution between January 2010 and December 2015 were investigated and compared.

*Research results*
The mean operative time for scar revision surgery was significantly shorter than that for double diamond-shaped flap anoplasty. The average of length of hospital stay was also significantly shorter after scar revision surgery than after anoplasty.

*Research conclusions*
Scar revision surgery may be preferable for mild anal stenosis upon conservative treatment failure. Anoplasty is unavoidable for moderate or severe stenosis, where cicatrized tissue is extensive.

*Research perspectives*
Further study must conduct to analyze which surgery have benefit to different severity of anal stenosis.
FOOTNOTES

**Author contributions:** Weng YT contributed to this work; Weng YT, Jung CK, Lin KH, Chang CK, Kang JC, Chen CY, Hu JM, and Pu TW designed the research study; Weng YT, Jung CK and Pu TW performed the research; Weng YT and Lin KH contributed new reagents and analytic tools; Weng YT, Jung CK, Lin KH and Pu TW analyzed the data and wrote the manuscript; all authors have read and approve the final manuscript.

**Institutional review board statement:** The study was reviewed and approved by the Taiwan Adventist Hospital Institutional Review Board, Approval No. 111-E-01.

**Conflict-of-interest statement:** The authors have no conflicts of interest to declare.

**Data sharing statement:** No additional data are available.

**STROBE statement:** The authors have read the STROBE Statement—checklist of items, and the manuscript was prepared and revised according to the STROBE Statement—checklist of items.

**Open-Access:** This article is an open-access article that was selected by an in-house editor and fully peer-reviewed by external reviewers. It is distributed in accordance with the Creative Commons Attribution NonCommercial (CC BY-NC 4.0) license, which permits others to distribute, remix, adapt, build upon this work non-commercially, and license their derivative works on different terms, provided the original work is properly cited and the use is non-commercial. See: https://creativecommons.org/Licenses/by-nc/4.0/

**Country/Territory of origin:** Taiwan

**ORCID number:** Yu-Tse Weng 0000-0002-6995-5097; Kuan-Jung Cha 0000-0002-4426-7087; Kuan-Hsuan Lin 0000-0002-3371-5489; Chun-Kai Chang 0000-0002-5401-0285; Jung-Cheng Kang 0000-0001-7511-5337; Chao-Yang Chen 0000-0002-2246-7635; Je-Ming Hu 0000-0002-7377-0984; Ta-Wei Pu 0000-0002-0538-407X.

**S-Editor:** Chang KL

**L-Editor:** A

**P-Editor:** Chang KL

REFERENCES


