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Factors associated with patient-reported outcomes following coccygectomy for chronic coccydynia

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Aims

The aim of this study was to identify factors associated with poor outcome following coccygectomy on patients with chronic coccydynia and instability of the coccyx.

Methods

From the Danish National Spine Registry, DaneSpine, 134 consecutive patients were identified from a single centre who had coccygectomy from 2011 to 2019. Patient demographic data and patient-reported outcomes, including pain measured on a visual analogue scale (VAS), Oswestry Disability Index (ODI), EuroQol five-dimension five-level questionnaire, and 36-Item Short-Form Health Survey questionnaire (SF-36) were obtained at baseline and at one-year follow-up. Patient satisfaction was obtained at follow-up. Regression analysis, including age, sex, smoking status, BMI, duration of symptoms, work status, welfare payment, preoperative VAS, ODI, and SF-36 was performed to identify factors associated with dissatisfaction with results at one-year follow-up.

Results

A minimum of one year follow-up was available in 112 patients (84%). Mean age was 41.9 years (15 to 78) and 97 of the patients were female (87%). Regression showed no statistically significant association between the investigated prognostic factors and a poor outcome following coccygectomy. The satisfied group showed a statistically significant improvement in patient-reported outcomes at one-year follow-up from baseline, whereas the dissatisfied group did not show a significant improvement.

Conclusion

We did not identify factors associated with poor outcome following coccygectomy. This suggests that neither of the included parameters should be considered contraindications for coccygectomy in patients with chronic coccydynia and instability of the coccyx.

Cite this article: *Bone Jt Open* 2021;2-7:540–544.

Keywords: Coccyx, Coccydynia, Prognostic factors, Patient-reported outcome measures

Introduction

Coccydynia is a painful condition with symptoms confined to the tailbone and the surrounding tissue,[1] affecting primarily females.[2] The aetiologies of common coccydynia are diverse and risk factors for its development are direct coccygeal trauma, obesity, childbirth, and female sex.[3-6] The anatomical configuration and mobility of the coccyx may also contribute to the development of coccydynia, as instability in the form of hypermobility or subluxation in coccygeal joints can force the tailbone into a sharply forward angulated position, especially when patients are sitting.[7-10] Pain is primarily present when sitting, or when moving from sitting to standing position, and can cause difficulty when defecating.[9,11]

Current available treatment options consist of noninvasive therapy ranging from physiotherapy, specialized sitting cushions, and non-steroidal anti-inflammatory drugs (NSAIDs), to steroid injections, radiofrequency ablation, and surgical removal of the coccyx.[12]

Coccygectomy is usually considered only when a patient's symptoms are unresponsive to both noninvasive treatments and steroid

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doi: 10.1302/2633-1462.27.BJO-2021-0018.R2

Bone Jt Open 2021;2-7:540–544.

Table I. Baseline characteristics of respondents.

Characteristic	Respondents
Total, n (%)	112 (84)
Females, n (%)	97 (87)
Mean age, yrs (SD)	41.9 (11.4)
Mean BMI, kg/m² (SD)	26.7 (5.0)
Smokers, n (%)	22 (20)
Mean VAS pain (SD)	70.0 (20.1)
Mean ODI (SD)	32.3 (13.0)
Mean EQ-5D (SD)	0.52 (0.29)
Mean SF-36 PCS (SD)	37.9 (9.1)
Mean SF-36 MCS (SD)	46.0 (11.2)

EQ-5D, EuroQol five-dimension questionnaire; ODI , Oswestry Disability Index; SD, standard deviation; SF-36 MCS, Short Form 36 v1 Mental Component Summary Score; SF-36 PCS, Short Form 36 v1 Physical Component Summary Score; VAS, visual analogue scale (0 to 100).

injections. Previous studies have shown good results from coccygectomy in comprehensive series of patients refractory to other treatment options.[11,13-19] Several studies investigating the effectiveness of coccygectomy on patients with chronic coccydynia conclude that careful patient selection is critical in order to achieve successful relief of symptoms.[10,20-22]

Some prognostic factors relevant to the success of treatment for coccydynia have previously been investigated,[22,23] showing that obesity might be associated with a poor outcome, whereas traumatic aetiology may be associated with a good outcome. As research on the topic is very limited, further research on larger prospective series, specific to painful instability, is needed to evaluate the association between prognostic factors and a successful outcome on surgical removal of the coccyx.

The aim of this study is to investigate the association of age, sex, smoking status, BMI, duration of symptoms, work status, and welfare payment, as well as the degree of pain, disability, and quality of life prior to surgery, with the success of coccygectomy in patients with coccydynia due to instability of the coccyx.

Methods

Patients. This is a retrospective study of prospectively collected data on 134 consecutive patients from the Danish National Spine Registry, DaneSpine.[24] Patients included in this study were all diagnosed with primary coccydynia and were shown to have instability of the coccyx, either as hypermobility or subluxation, through rectal examination; with distinct sitting pain reproducible through intrarectal coccygeal manipulation. Patients referred were examined in the outpatient clinic with bimanual palpation of the coccyx by an experienced surgeon. If instability was present and manipulation reproduced the patient's symptoms, the patient was referred to steroid blocks performed with the patient laying in the prone position placed in the CT scanner. All patients underwent three steroid blocks, with an interval of eight to 12 weeks. If the patients only experienced temporary relief, they were offered surgery. All patients were examined and treated by a single surgeon (AS) at the Spine Centre of Southern Denmark from September 2011 to February 2019.

Patients who had surgery due to malignant or congenital disorders or reoperations due to infection, fracture after previous amputation of the coccyx, or soft-tissue complications from any surgery in the area were excluded from the study.

Data use approval was acquired from the Danish Data Protection Agency (reference number 16/1586). The study was reviewed and approved by the Research Board of the Centre for Spine Surgery and Research at Lillebaelt Hospital. Waiver of informed consent for this retrospective review of data was granted. Subjects provided consent for use of their data at the time that they completed the questionnaires and were enrolled in DaneSpine.

Surgical procedure. The procedure was performed under general anaesthesia. Patients were placed in a prone position and the skin of the buttocks was distracted using wide surgical tape. A marking in line with the mobile segment was made, and a 4 cm skin incision was made in line with the coccyx, gaining access to the soft-tissue and the coccyx. The small vein on the posterior side of the coccyx was ligated, and a longitudinal incision, corresponding to the mobile segment, was made in the soft-tissue sack. This allowed the mobile segment including the segments below to be removed. If the disc above the mobile segment was intact, then it was preserved at the end of the resection. The soft-tissue sack was closed, followed by a skin closure in three layers, using absorbable sutures.

Measures. Baseline characteristics were obtained from DaneSpine, modified by including questions regarding coccygeal pain. The questionnaire included demographic data and patient-reported outcome measures (PROMs), including the visual analogue scale (VAS) measure of pain,[25] the Oswestry Disability Index (ODI) measure of disability,[26–28] the EuroQol five-dimension five-level questionnaire (EQ-5D) measure of quality of life,[29] and the 36-Item Short-Form Health Survey questionnaire (SF-36)[30] measure of physical and mental health comprising the physical component score (PCS) and mental component score (MCS). Based on the questionnaire in which patients were asked about their attitude towards the result of their surgery, patient satisfaction was divided into three categories: those who replied to be satisfied with surgery were categorized as 'Satisfied', those who replied to be dissatisfied as 'Dissatisfied', and those who replied to be neither satisfied nor dissatisfied as 'Undecided'. Potential prognostic factors associated with a poor treatment outcome based on clinical relevance were considered and collected from the questionnaires.

Statistical analysis. All analyses were performed using SPSS v. 26.0 (IBM, USA). Patients in the Satisfied,

Table II. Baseline characteristics of respondents between groups of satisfaction.

Characteristic	Satisfied	Undecided	Dissatisfied	p-value
Total, n (%)	78 (70)	20 (18)	14 (13)	
Females, n (%)	68 (87)	18 (90)	11 (79)	0.607
Mean age, yrs (SD)	42.8 (10.2)	41.2 (15.0)	37.9 (12.2)	0.325
Mean BMI, kg/m^2 (SD)	26.5 (4.5)	28.2 (6.2)	25.9 (5.7)	0.333
Smokers, n (%)	14 (18)	6 (30)	2 (14)	0.416
Mean VAS pain (SD)	69.0 (19.7)	73.1 (21.1)	79.1 (19.4)	0.199
Mean ODI (SD)	30.1 (12.0)	35.8 (15.2)	39.3 (12.5)	0.021
Mean EQ-5D (SD)	0.55 (0.28)	0.45 (0.32)	0.44 (0.33)	0.260
Mean SF-36, PCS (SD)	39.4 (8.5)	34.3 (9.0)	34.6 (10.9)	0.041
Mean SF-36, MCS (SD)	48.2 (10.5)	41.7 (10.1)	40.1 (13.0)	0.011

EQ-5D, EuroQol five-dimension questionnaire; ODI, Oswestry Disability Index; SD, standard deviation; SF-36 MCS, Short Form 36 v1 Mental Component Summary Score; SF-36 PCS, Short Form 36 v1 Physical Component Summary Score; VAS, visual analogue scale (0 to 100).

Table III. Difference in patient-reported outcomes baseline to one-year follow-up across the three groups.

Outcome	Satisfied	Undecided	Dissatisfied	p-value*
One-year follow-up, mean (SD)				
VAS pain	20.8 (24.3)	61.8 (19.7)	78.5 (26.9)	< 0.001
ODI	12.5 (16.1)	28.2 (12.5)	36.9 (16.8)	< 0.001
EQ-5D	0.84 (0.21)	0.57 (0.29)	0.36 (0.36)	< 0.001
SF-36, PCS	48.7 (9.8)	37.7 (8.8)	36.2 (9.4)	< 0.001
SF-36, MCS	52.0 (9.4)	45.9 (10.8)	38.5 (15.0)	< 0.001
Change from baseline, mean (SD)				
VAS pain	48.2 (28.8)	11.3 (28.1)	0.6 (25.4)	< 0.001
ODI	17.9 (11.1)	6.2 (9.7)	2.4 (11.0)	< 0.001
EQ-5D	0.29 (0.28)	0.17 (0.26)	-0.1 (0.18)	< 0.001
SF-36, PCS	9.3 (8.7)	0.6 (5.7)	1.0 (7.3)	< 0.001
SF-36, MCS	3.7 (11.6)	0.9 (9.0)	-3.4 (10.0)	0.104

*One-way analysis of variance.
EQ-5D, EuroQol five-dimension questionnaire; ODI, Oswestry Disability Index; SD, standard deviation; SF-36 MCS, Short Form 36 v1 Mental Component Summary Score; SF-36 PCS, Short Form 36 v1 Physical Component Summary Score; VAS, visual analogue scale (0 to 100).

Table IV. Binary logistic regression identification of prognostic factors.

Variable	Adjusted OR (95% CI)	p-value
Age	0.964 (0.906 to 1.025)	0.240
BMI	0.899 (0.770 to 1.049)	0.177
Sex	2.855 (0.414 to 19.708)	0.287
Smoking	0.391 (0.055 to 2.760)	0.346
Duration of pain	1.290 (0.418 to 3.982)	0.657
Work status	0.736 (0.121 to 4.481)	0.739
Receipt of welfare payments	0.000 (0.000 to 0.000)	0.998
ODI	1.055 (0.958 to 1.161)	0.280
SF-36 PCS	1.036 (0.912 to 1.178)	0.585
SF-36 MCS	0.951 (0.880 to 1.027)	0.201
VAS pain	1.028 (0.978 to 1.080)	0.283

CI, confidence interval; ODI, Oswestry Disability Index; OR, odds ratio; SD, standard deviation; SF-36 MCS, Short Form 36 v1 Mental Component Summary Score; SF-36 PCS, Short Form 36 v1 Physical Component Summary Score; VAS, visual analogue scale (0 to 100).

Undecided, and Dissatisfied groups were compared using analysis of variance (ANOVA) for continuous variables, presented as means and standard deviations (SDs), and Fisher's exact test for categorical variables, presented as amounts and percentages, to describe differences in key characteristics. Logistic regression analysis was performed to determine associations with patient dissatisfaction. Factors included in the model were age, sex, BMI, smoking status, duration of symptoms, work status, receipt of welfare payment, baseline VAS, ODI, and the SF-36 PCS and MCS. The p-value threshold for significance was set at 0.05.

Results

Of the 134 patients who met inclusion criteria, a minimum of one-year follow-up was available in 112 patients (84%) (Table I).

For patients with a minimum one-year follow-up, "Satisfied" patients had statistically significant better baseline ODI, SF-36 MCS, and PCS scores. No other significant differences were detected between the three groups at baseline (Table II).

The one-year outcome measures showed a statistically significantly greater improvement in the satisfied group. In the dissatisfied group the change in outcome measure was not significant from baseline to one-year follow-up (Table III).

Regression, including adjusted odds ratios (ORs) and related 95% confidence intervals, showed that none of

the investigated prognostic factors had a statistically significant association on the outcome of coccygectomy (Table IV).

Discussion

Although the objective of this study was to identify prognostic factors associated with poor outcomes after coccygectomy in patients with painful instability of the coccyx, the results of the current study suggest that none of the investigated parameters may present as a contraindication to perform coccygectomy in our cohort of patients. We were unable to identify any statistically significant associations between the baseline parameters and a poor outcome of coccygectomy in patients with painful instability of the coccyx.

It is the experience of the surgeon that patients do not tend to improve noticeably beyond the one-year mark following surgery, why the authors are inclined to reject the notion that a longer period of follow-up would result in a greater difference between outcomes and thus in a better analysis of prognostic factors. In a large study on coccygectomy, Hanley et al[13] reported no significant difference between patient-reported outcomes at one and two years postoperatively.

The strict indications for coccygectomy in the current cohort, primary coccydynia with hypermobility, pain reproduction on rectal examination and transient pain relief from three local steroid injections prior to surgery, may have contributed to the low incidence of dissatisfied patients. This is in line with the rationale brought forth by Maigne et al[10] that detection of either hypermobility or a certain degree of subluxation provides objective evidence of an organic lesion in chronic coccydynia patients which may be amenable to coccygectomy. Surgical removal eliminates the mechanical stress caused by the mobile segment, resulting in pain relief. Considering that traumatic aetiology has been suggested to be a prognostic factor related to a successful outcome,[22,23] coccydynia with a confirmed diagnosis of coccygeal instability may be a prognostic factor for a successful outcome in its own right.

A previous article concerning prognostic factors on coccygectomy in patients with coccydynia found that high BMI might be correlated with a poor outcome after surgery.[23] However, the current study did not find an association of BMI with dissatisfaction. This is despite the fact that the mean BMI in the entire cohort was in the overweight category (26.7 kg/m^2) and 25% of the patients in our cohort had a BMI greater than 30 kg/m^2.

The major limitations of the present study are the use of retrospective analysis using data from a registry with patients enrolled prospectively, a lack of full one-year follow-up on all patients and the limit on length of follow-up set by the database. Although this may introduce selection bias, a previous drop-out analysis on the same database by Højmark et al[31] in 2016 found that non-respondents often were younger smokers who were back at work and with better self-reported outcomes. Thus, lack of complete follow-up is not likely to negatively affect the results. Although both the EQ-5D and SF-36 were collected, only the SF-36 summary scores were included in the analysis as both are generic measures of health-related quality of life. The binary logistic regression model for identifying prognostic factors was limited to include 11 variables due to the sample size available for analysis. Another included measure, ODI, is not a validated measure of disability regarding the coccyx, but is designed specifically for lower back disease. Nevertheless, we find it to be the best approximate to a measure of disability in patients with coccygeal disorders available. This is the largest study to investigate prognostic factors related to the outcome of coccygectomy and the first study to evaluate prognostic factors in a cohort solely containing patients with painful instability of the coccyx. Future studies should aim to investigate the correlation between different aetiologies and the outcome of coccygectomy in order to improve patient selection.

In a large consecutive cohort of patients with coccydynia and instability of the coccyx, no baseline parameters were identified as a prognostic for a poor outcome following coccygectomy. The majority had satisfactory results of their surgery. It is clinically relevant to consider that these factors, which might be suspected to entail a poor surgical outcome, should not influence the decision to perform coccygectomy on patients with coccydynia and instability of the coccyx.

Take home message

- Patient characteristics traditionally associated with poor surgical outcome should not discourage surgeons from performing coccygectomy when deciding on the best care for patients with persistent coccydynia and instability of the coccyx.

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Funding statement:
- No benefits in any form have been received or will be received from a commercial party related directly or indirectly to the subject of this article. Open access funding was self-funded through the authors' institution, the Spine Center of Southern Denmark.

Acknowledgements:
- We would like to thank our research coordinator, Karen Højmark, for facilitating the extraction of data from the DaneSpine database.