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Coccydynia – could age, trauma and body mass index be independent prognostic factors for outcomes of intervention?

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ABSTRACT

INTRODUCTION The aetiology of coccydynia can be multifactorial, with several associated factors such as obesity, female gender and low mood. The long-term results of operative interventions, such as manipulation under anaesthesia and coccygectomy are variable, ranging from 63–90%.

MATERIALS AND METHODS Our aim was to identify whether age, trauma and body mass index (BMI) were independent prognostic factors in coccydynia treatment. All patients who presented to the Royal Derby Hospital with a primary diagnosis of coccydynia between January 2011 and January 2015 who had injections, manipulation under anaesthesia or coccygectomy were included. We used patient-reported satisfaction score as the primary outcome measure. We hypothesised that patients with preceding history of trauma and with high BMI (> 25) would be less satisfied. We divided patient BMI into four groups, following World Health Organization guidelines: group A (18.5–24.9), group B (25–29.9), group C (30–39.9) and group D (> 40).

RESULTS A total of 748 patients were diagnosed with coccydynia. Of these, 201 patients had 381 injections, 40 had 98 manipulations under anaesthesia and 9 had coccygectomy. Mean age was 46.4 years; 26% of patients had trauma to the coccyx. The mean time to follow-up was 7.3 months. We found a statistically significant difference ($P = 0.03$) between satisfaction scores in groups B and D. Patients who had trauma improved significantly ($P = 0.04$). The odds ratio calculation of coccygectomy and BMI revealed a higher risk of coccygectomy in Group A.

DISCUSSION This is the first study to establish BMI and trauma as independent prognostic factors for coccydynia treatment. Our hypothesis that patients with higher BMI would have lower satisfaction levels has been proven true.

KEYWORDS
Coccydynia – Coccygodynia – BMI – Coccygectomy

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Introduction

The success rate of treatment of coccydynia varies widely.[1–3] It is not well understood whether treatment outcome is related to any predictable patient factors. The purpose of this study was to investigate the reasons behind the variable response to treatment for coccydynia. More specifically, we wanted to see whether body mass index (BMI), age and trauma were prognostic factors in identifying response to treatment. We hypothesised that patients who had trauma and with high BMI (> 25) would be less satisfied with treatment of coccydynia.

Simpson coined the term 'coccydynia' or 'coccygodynia' in 1859.[4] The coccyx has three to five segments. The first segment articulates with the terminal segment of sacrum, thus forming the fifth sacral foramen to accommodate the anterior division of fifth sacral nerve. Coccyx provides attachment to structures such as sacrococcygeal and sacrosciatic ligaments, levator ani and coccygeus muscles. Its tip protects the rectum via the iliococcygeus tendon.[5] Coccydynia is known to be multifactorial, with trauma being the most common cause.[6,7] Nathan *et al.* suggested that morphological variations in the coccyx may have a role in the aetiology of coccydynia.[8] Maigne suggested that the variations in the rudimentary intersegmental disc spaces and mobility of the segments could be major factors in the aetiology.[9] Low mood, obesity[10] and female gender[11] have also been reported to be associated factors.

An effective single treatment still eludes us in managing the unsolved mystery of coccydynia. The possible explanations lie in anatomical and physiological variations in the coccyx and aetiological differences in coccydynia. Non-operative management such as physiotherapy, analgesia, laxatives, hot baths, cushions, shockwave ultrasound therapy

and ganglion impar blocks have proven to be effective in a majority of patients.[12] Radiofrequency thermocoagulation of the ganglion impar has been shown to improve pain scores.[13] Patients refractory to conservative measures are referred to specialists for local steroid injections, manipulation under anaesthesia (MUA) or coccygectomy, which are all established modalities of treatment. However, the long-term results of these procedures are variable, with success rates ranging from 63% to 90%.[1–3] We could not identify any studies that explained the reason for this wide range in results.

Methods

We identified all patients who presented to the Royal Derby Hospital with a primary diagnosis of coccydynia from January 2011 to January 2015. Data were obtained by retrospective review of the hospital clinical coding system database. We reviewed all the case notes and clinic letters for patients identified with a primary diagnosis of coccydynia and excluded those with other primary spinal pathologies. All patients who had injections, MUA or coccygectomy with at least 6 months' follow up were included. Patient notes were reviewed to obtain group characteristics, comorbidities, aetiology, type of intervention and outcomes.

We confirmed the diagnosis in the clinic through a combination of clinical presentation and typical local tenderness over the coccyx on clinical examination, plain radiographs or magnetic resonance imaging. Patients listed for injections received 40 mg of triamcinolone and 5 ml of 0.5% chirocaine under x-ray guidance. Patients who did not improve or obtained partial response were offered repeat steroid local injection. In patients where flexion of the coccyx was noted on preoperative imaging, we performed digital rectal examination under general anaesthesia followed by MUA and injection of a mixture of steroid and local anaesthesia as their primary mode of treatment. If a patient did not improve after three injections or MUA, a coccygectomy was offered. A combination of consultants and registrars performed the interventions. We used patient-reported satisfaction score of 0–100% at 6 weeks as the primary outcome measure. This was obtained by a direct interview of patients by a health professional 6 weeks post-intervention and the results were documented in the clinic letter as standard practice for all the patients with coccydynia. This study was registered with the trust's clinical governance department as an observational study; hence, ethical approval was deemed not to be necessary.

We divided patients into four groups based on their BMI, following World Health Organization guidelines.[14] Group A (BMI 18.5–24.9), group B (25–29.9), group C (30–39.9) and group D (> 40). We tested our hypothesis to see whether trauma, age and BMI had any significant role in patient satisfaction. We also assessed the odds ratio of BMI and trauma on the mean number of injections, MUA and risk of coccygectomy. We used the Mann Whitney U test to identify any significant difference between the groups as our data were not normally distributed. We also performed a chi-square test to compare nominal data: number of injections. A *P*-value less than 0.05 was considered to be statistically significant.

Results

We identified a total of 748 patients with a primary diagnosis of coccydynia presenting to the Royal Derby Hospital between January 2011 and January 2015. Of these, 547 patients improved with non-surgical interventions such as physiotherapy, analgesia and cushion supports; 381 sacrococcygeal joint injections were performed in 201 patients (mean 1.9 injections/patient) and 40 patients had a total of 98 MUA (mean 2.4/patient). Finally, 9 patients who did not respond to injections or MUA had coccygectomy performed. Cure rates for injections and MUA were each 80%. The patient symptoms relapse rates were 30% and 25%, respectively, for those treated with injection alone and MUA.

The mean age of the patients was 46.4 years. Women made up 88% of our group. There were 20% patients in group A, 36% in group B and 22% each in groups C and D (Table 1). Mean time to follow-up was 7.3 months. Some 26% of patients reported a preceding fall with direct impact on the coccyx and 10% reported having coccygeal pain secondary to having childbirth. Group C had the highest number of injections performed (mean 2.7 per patient; $P = 0.53$) followed by group D (mean 2.6; $P = 0.54$; Table 2). The mean numbers of MUA were comparable between the four groups (Table 3). The mean numbers of coccygectomy were evenly distributed across the four groups (Table 4).

Patients in Group B improved the most with their interventions. The satisfaction scores significantly differed

Table 1 Satisfaction scores across the four groups indicating a better response in group B ($P = 0.23$)

Group	Body mass index		Patients (*n*)	Mean age (years)	Comorbidities (%)	Trauma aetiology (%)	Satisfaction score
	Range	Mean					
A	18.5–24.9	21.9	40	41.7	0.8	0.3	0.60
B	25–29.9	26.9	71	47	1.1	0.35	0.78
C	30–39.9	32.3	46	49.8	1.3	0.1	0.64
D	> 40	42.5	44	46.7	1.8	0	0.63

Table 2 Patients treated with injections only. Groups C and D had more injections ($P = 0.53$ and 0.54, respectively). Satisfaction rates were statistically not significantly different between the groups

Group	Patients (*n*)	Injections			Satisfaction score
		n	Mean	Range	
A	34	78	2.3	1–5	0.60
B	58	116	2.0	1–5	0.78
C	35	95	2.7	1–6	0.62
D	34	92	2.6	1–6	0.63

Table 3 Patients treated with manipulation under anaesthesia (MUA) and injection. All the four groups had a similar mean number of MUA. Group B had improved satisfaction score ($P = 0.13$)

Group	Patients (*n*)	MUA			Satisfaction score
		n	Mean	Range	
A	6	16	2.6	1–5	0.54
B	13	27	2.1	1–5	0.76
C	11	29	2.6	1–6	0.58
D	10	26	2.6	1–4	0.63

Table 4 Coccygectomy patients divided into their body mass index groups

Group	Coccygectomy		Satisfaction score
	n	Mean	
A	4	0.3	0.67
B	1	0.21	0.75
C	1	0.18	0.75
D	3	0.27	0.67

between group B and D (Table 5). None of the other groups showed a statistically significant improvement in their satisfaction scores. Further sub-analysis of the modes of treatment across the four groups did not reveal a statistically significant difference across the four groups. Patients who had an injection only, MUA and coccygectomy reported a mean satisfaction score of 62%, 67% and 71%, respectively, with no statistically significant difference between the groups with different interventions.

Patients presenting with trauma to the coccyx showed a statistically significantly improved response to treatment

Table 5 Comparison of *P*-values of satisfaction scores of the four groups in the study

Variable	Comparator	*P*-value (satisfaction score)
A	B	0.25
A	C	0.41
A	D	0.08
B	C	0.35
B	D	0.039[a]
C	D	0.38

[a] Statistically significant difference between groups B and D

Table 6 Trauma plays a significant prognostic role in treatment of coccydynia patients

Variable as prognostic factor	*P*-value (student t test) of satisfaction score
Trauma	0.04[a]
Age (< 50 years)	0.13
Childbirth	0.07

[a] Statistically significant

(mean satisfaction score of 80%) compared with others (mean score of 61%; Table 6). An odds ratio (OR) calculation to identify association between coccygectomy and BMI revealed a higher risk in group A (OR = 2.2, $P = 0.29$). One patient in group A had a deep infection following a coccygectomy, which improved with antibiotic therapy and wound debridement. Satisfaction rates were comparable between the four groups post-coccygectomy (Table 3).

Discussion

This study is the first to compare the results of intervention with BMI, trauma and age as independent risk factors. We found that patients with a BMI of less than 30 who had direct trauma to the coccyx responded favourably to interventions. This was reflected in their satisfaction scores at 6 weeks from the intervention.

We used a retrospective review of the database with a standardised clinical coding system (Infoflex) with 100% user compliance within our trust. Every patient with a primary diagnosis of coccydynia was included in this study. Lumbar spine disorders are known to be coexistent with coccydynia.[15] We excluded patients with primary lumbar spine pathology, thus ensuring a homogenous patient group. This was a pragmatic study with 16 surgeons ranging from senior trainees to consultants treating the patients. The results are thus more applicable to the general population. A health professional independent of our study performed data collection, thus improving the strength of this study.

We treated our patients in a stepwise approach, similar to the approach of Wray et al.[3] Our cure rate was 80% for both injections and MUA in comparison with their 59% and 85%, respectively. Our primary outcome measure at 6 weeks may be considered short term. However, we followed-up patients who did not improve for longer periods, each time measuring their satisfaction score at the 6-week stage from their latest intervention. We could not identify a validated scoring system for treatment of coccydynia in the literature, so we used the patient-reported satisfaction score as our primary outcome measure. A combination of patient- and clinician-derived factors were noted to result in a high number of injections in groups C and D. These factors are partial improvement after initial injection, idiopathic coccydynia, associated comorbidities such as psychiatric disorders. A trend towards very low scores was found in patients with a BMI less than 20. These patients with more superficial coccyx could be more symptomatic, which could partly explain their low scores.

Recent publications have shown suboptimal results for lumbar spine surgery in patients who are obese.[16] Maigne reported up to three times the incidence of coccydynia in patients with a high BMI (males > 29.4 and females > 27.4).[10] Our study further shows that patients with a BMI of more than 30 respond less favourably to treatment. Pennekamp reported that a direct fall on to the coccyx is the most common aetiological factor in around 50% of patients.[17] We found that 26% of our group reported trauma to the coccyx. These patients responded more favourably than those who had childbirth and other aetiological factors. We did not classify our patients based on their coccygeal morphology[15] or mobility.[9] However, the high relative risk of coccygectomy in patients in group A could be due to high incidence of hypermobility in this group. We acknowledge that using a classification system to detect mobility of coccyx is advisable but may be prone to a high inter- and intraobserver bias. Coccygectomy has been shown to have less favourable outcomes in patients with psychiatric disorders, preoperative opiate use and more than three comorbidities.[18] Our group of coccygectomy patients had no incidence of psychiatric disorders and had a mean of one comorbidity per patient. We also acknowledge that this study is retrospective, observational and not randomised.

A study comparing conservative (physiotherapy, analgesia, laxatives, hot baths, cushions, shock wave ultrasound therapy, local injections and ganglion impar blocks) and operative (MUA and coccygectomy) treatment would more definitively establish the association between BMI, trauma and outcomes of treatment in coccydynia.

Conclusion

We conclude that those coccydynia patients with a BMI less than 30 and those who had trauma of to the coccyx respond better with treatment modalities such as MUA, coccygectomy and local steroid injections.

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