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Original Investigation

Pelvic Incidence as a Prognostic Factor in Coccydynia

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ABSTRACT

AIM: To evaluate the pelvic incidence (PI) of coccydynia patients treated by different methods and to determine whether it is a risk factor or a prognostic factor.

MATERIAL and METHODS: Patients who were treated for coccydynia were evaluated retrospectively, and 110 patients were enrolled. Spinopelvic parameters were measured by using Surgimap software, and the position of the coccyx was evaluated according to the Postacchini classification. The results were compared to spinopelvic parameters of healthy population.

RESULTS: The mean PI of the coccydynia patients did not differ from the healthy population, and there were no differences between treatment subgroups. The Postacchini classification showed that patients with type-3 and type-4 configurations had higher PI. When treatment groups were evaluated according to Postacchini classification, 80% of the surgery group had type-3 and type-4 configurations (50%, 30% respectively).

CONCLUSION: This is the first study to evaluate the PI of coccydynia patients. Patients with higher PI were prone to having type-3 of type-4 coccyx configurations and undergoing surgical treatment.

KEYWORDS: Coccydynia, Pelvic incidence, Treatment, Risk factor

INTRODUCTION

Pain in the sacrococcygeal region is defined as 'coccygodynia' or 'coccydynia' and Simpson described it in1859 (5,8,11,26,28). Etiological factors include direct trauma, minor repetitive traumas, childbirth, and idiopathic reasons. Coccygodynia is five times more frequent in females, and those in their thirties or forties are mostly affected (5,8,19).

Symptoms of coccygodynia are triggered by prolonged sitting in an incorrect, forced, or uncomfortable position or on an uncomfortable surface (5,14). Schapiro called coccydynia the 'television disease' due to the sitting position (17,22). Although sitting in such an uncomfortable position or place is common in this age of technology only a few people complain of coccydynia. Similarly, few patients suffer after direct trauma to the coccyx. Predisposing factors that cause coccydynia still remain unclear. Obesity, sudden weight loss, and trauma are independent prognostic factors for coccygodynia. Posterior shift of the coccyx is the only predictive or prognostic radiological factor that defined for coccygodynia (5,10).

The effect of obesity on coccydynia is related to lower mobility of the pelvis in sagittal plane (5). Pelvic tilt (PT), sacral slope (SS), and pelvic incidence (PI) are the three angular measurements used in pelvic analysis in the sagittal plane (23). PI measurements are between 28° and 84°, and thisstatic morphological parameter is constant throughout life except for malt changes during growth (2,9,15,21,24). As a constant parameter that demonstrates the sagittal position of the sacrum and coccyx, PI can be considered as a prognostic factor or a risk factor for coccydynia. The aim of this study is to evaluate the PI of coccydynia patients treated by different methods and determine whether it is a risk factor or a prognostic factor (Figure 1).

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MATERIAL and METHODS

Patients admitted to our clinic between January 2014 and December 2017 due to coccydynia were evaluated retrospectively. Patients with inappropriate radiography or missing data were excluded from the study, and 110 patients were enrolled. Demographic data of the patients were recorded. The mean patient age was 35.6 ± 9.9 years. The Postacchini classification was used for radiological evaluation (18), and spinopelvic parameters were measured using Surgimap software.This software is well documented for its accuracy, efficacy, and high intra and inter-observer reliability as a spine-measurement tool (12).

The results were compared with the spinopelvic parameters in healthy population. PI, PT, and SS in healthy populations are accepted as 49 ± 10°, 7.8 ± 8.1°, and 42.4 ± 8.6°, respectively (27). Patients were divided into three treatment groups: conservative treatment, local injection, and surgery. The groups were compared to each other to determine data that could serve as a prognostic factor.

SPSS 18.0 software was used in the statistical analysis. The comparison of spinopelvic parameters were compared between groups using a paired t-test, and comparison of the spinopelvic parameters were compared between patients and the normal population using a one-sample t-test. The level of significance was set at $p<0.05$.

RESULTS

Out of 110 patients, 47 (38 female, 9 male) were treated conservatively (nonsteroidal anti-inflamatory drugs, sitting modifications and offloading cushions), 37 (27 female, 10 male) were treated by local injections and 26 (19 female, 7 male) were treated by surgical excision of the mobile coccygeal segment. For the treatment algorithm, we applied conservative measures for all patients,local injections and surgery in cases that did not respond to conservative measures or injections, respectively.

The mean PI of all patients was 47.5 ± 9.8° and there were no statistical differences compared to the healthy population. In the treatment subgroups, mean the PI in the conservative treatment, local injection and surgery groups was 47.7 ± 9.9°, 46.2 ± 9.0° and 48.8 ± 10.5° respectively. There was no statistical difference between the treatment subgroups and healthy population. PT and SS are not constant parameters and could be altered by positioning of the patient or X-ray beam or by different pathologies. Because of this, these spinopelvic parameters were not evaluated.

According to the Postacchini classification, 19 patients hadtype-1, 37 patients had type-2, 34 patients had type-3, and 22 patients hadtype-4 configurations. PI in these groups was 45.6 ± 9.0°, 45.6 ± 8.9°, 48.4 ± 10.7°, and 50.6 ± 9.4° respectively. PI was significantly higher in those with type-3 and 4 than type 1 and 2. Additionally, 50% of the patients had type-3 and 30% of the patients had type-4 coccyx configuration in the surgery group. The coccyx configurations of the conservative treatment and injection groups were similar configurations (Table I).

DISCUSSION

Coccydynia is not a frequent symptom,and most patients who suffer direct trauma to the coccygeal region do not suffer from the condition. Other reasons for coccydynia show a wide variety ranging from minor repetitive trauma to coccygeal tumors (3-5,8,25). Conservative treatment, which consisting of NSAIDs and sitting modifications, is usually effective and should be the first step of treatment (7,20). Local injections could be a second step of treatment when the conservative treatment fails (1,7,16). When patients do not respond to non-surgical measures, coccygectomy is usually indicated to relieve pain (3-5,8,25). There is no predictive factor that determines the most efficient treatment method for a patient. Different patients with the same age, gender, and injury mechanism can be treated with different treatment modalities. In our study, patients were treated using the same algorithm, and we could not identify any predictive factor.

Pelvic analysis in the sagittal plane is done using spinopelvic parameters consisting of three angular measurements (23). PT is defined as the angle between the vertical plumb line and the line drawn from the midpoint of the sacral plate and the femoral head axis. PT could be altered to compensate for spinal pathologies and to keep the spine in the most vertical positionpossible. Also, PT could change over time.

SS is defined as the angle between the horizontal line and sacral plate and it changes depending on PT (9,12,23). PI is defined as the angle between the line perpendicular to the sacral plate at its midpoint and the line connecting this point to the femoral head axis. PI is a static morphological parameter that is constant throughout life (6,9,12,13,23) and it demonstrates the sagittal alignment of a person's pelvis. Consequently, it could make the coccyx prone to trauma and coccydynia (Figure 2).

To our knowledge, PI has never been investigated in the literature as a prognostic factor or a risk factor for coccydynia. In this study, we hypothesized that higher PI could be a risk factor for coccydynia, but the results showed no significant difference between healthy population. Furthermore, no difference was found between the treatment subgroups.

Postacchini and Massobrio determined four types of coccyx configurations based on lateral radiographs (18). The coccyx is curved slightly forward in type I, pointing straight forward in type II, sharply angled forward in type III, and subluxated in type IV. According to this classification, increased angulations can cause increased inflammatory pathology (11,18,25). To our knowledge, our study is the first to investigate the relationship between the Postacchini classification and PI. In our study, the PI of coccydynia patients showed no difference compared to the healthy population. However, when patients were subgrouped according to the Postacchini classification independent from the treatment methods, type-3 and type-4 subgroups had higher PI than the type-1 and type-2 subgroups. Consequently, we can suggest that patients with higher PI are more likely to have type-3 or type-4 coccyx configurations. In our study, 80% of the surgery group had type-3 or type-4 coccyx configuration, and it can interpreted

Table I: Postacchini Classifications of the Patients in Term of Treatment Methods

	Type 1 n (%)	Type 2 n (%)	Type 3 n (%)	Type 4 n (%)	Total (n)
Conservative	11 (23)	18 (38)	12 (25)	6 (12)	47
Injections	7 (18)	14 (37)	9 (24)	6 (16)	37
Surgery	1 (5)	4 (15)	13 (50)	8 (30)	26

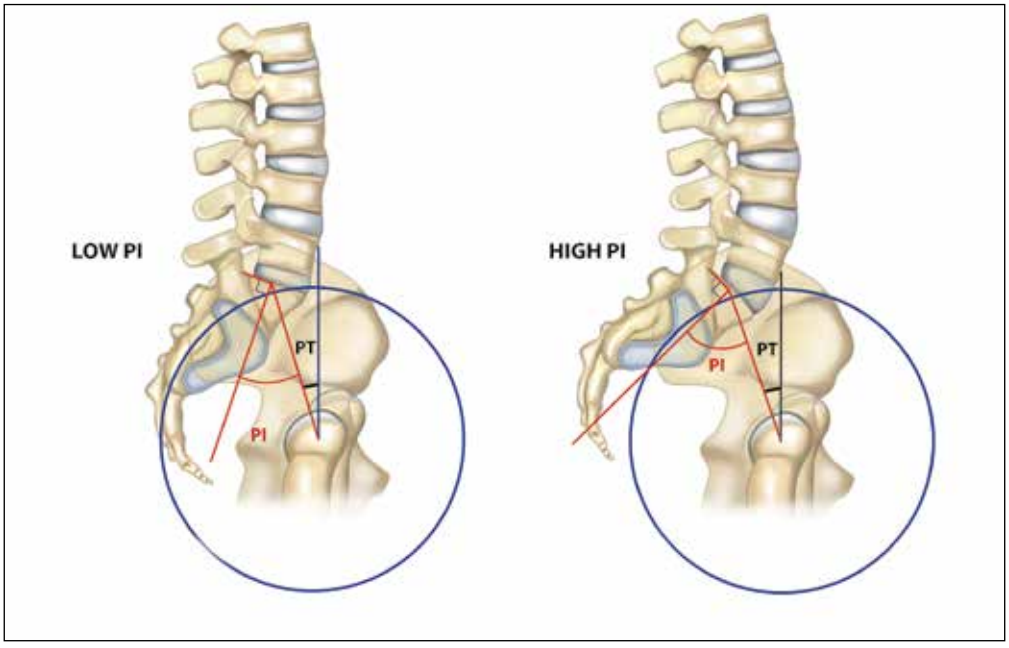

Figure 1: Relation of pelvic incidence and coccyx sagittal location. Higher pelvic incidence makes coccyx prone to trauma.

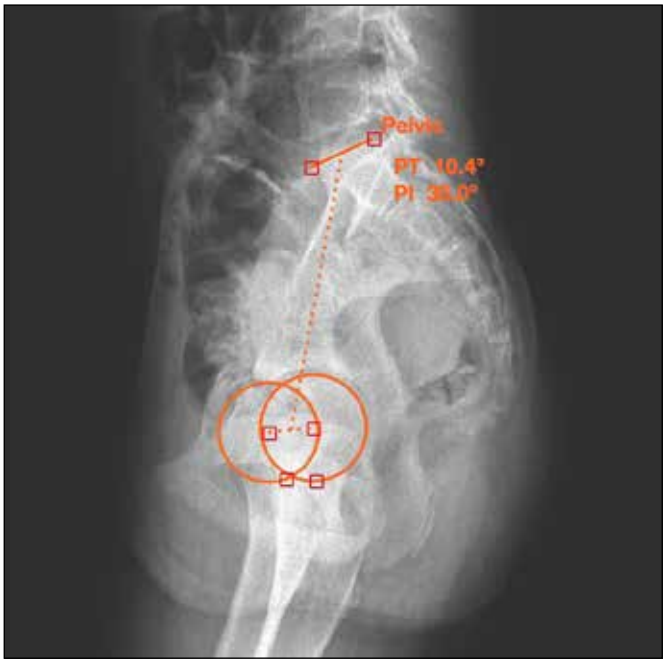

Figure 2: Measurement of sagittal parameters by Surgimap software.

that these configurations and higher PI are risk factors for surgical treatment.

The limitations of this study are its retrospective design and relatively low number of patients. However, this is the first study to evaluate PI in coccydynia patients and the results are promising. This study is the first step toward future studies with further details and larger sample sizes.

CONCLUSION

There has been no data in the literature about PI in coccydynia patients. These first results showed that patients with higher PI are prone to have type-3 and type-4 coccyx configurations and are more likely to undergo surgical excision when they suffer from coccydynia. It could be interpreted that coccydynia patients with higher PI move forward in the treatment algorithm more quickly compared to patients with lower PI.

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