An evaluation of two different methods of coccygectomy in patients with traumatic coccydynia

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Purpose: The aim of this study was to evaluate the results of partial and total coccyx excisions in patients with traumatic coccydynia resistant to conservative treatment.

Patients and methods: The study included 22 patients (from a total of 27) who underwent partial or total coccygectomy because of persistent coccydynia between December 2007 and January 2014. There were 15 females and 7 males with a mean age of 33.6 years (range 23–46 years). Partial coccygectomy was performed in 14 patients and total coccygectomy in 8. They were evaluated according to their pre- and postoperative visual analog scale (VAS) scores. The mean follow-up period was 28 months (range 16–48 months).

Results: The mean VAS scores in the total excision group were 8.88±0.64 preoperatively and 2.5±2.67 at the final postoperative follow-up examination. In the partial excision group, these values were 8.79±0.89 preoperatively and 2.5±2.85 postoperatively. No statistically significant difference was determined between the two groups with respect to the mean scores (p>0.05). No rectum injury was seen in any patient. When the VAS scores of the patients were evaluated as a whole, excellent and good results were obtained in 78%. Patient satisfaction with the operation was 90%.

Conclusion: Coccyx excision is a successful treatment method in patients with long-term coccydynia who are resistant to conservative treatment. Two different surgical methods can be applied in the treatment and both of them have low complication rates and high patient satisfaction.

Keywords: partial excision, total excision, coccyx, visual analog scale

Introduction
Coccyx is the most distal part of the spine and is generally formed of four, and sometimes five, segments. Anatomically, there is a relationship with the fifth sacral and coccygeal nerve root and the terminal sympathetic plexus, and it is connected to the pelvic muscles. Pain occurring in the coccyx region is known as coccydynia or coccygodynia.1,2 The reason, in most cases, is trauma that is mostly associated with a fall onto the tailbone. Other reasons may be masses such as chordoma or intradural schwannoma, infections, or idiopathic pain of unknown origin, which could be owing to sacrococcygeal joint degeneration.3 In addition to trauma-related acute pain, there may be pain for a long time associated with nonunion of fracture. Sometimes, pain associated with lumbar stenosis and disk degeneration may be confused with coccydynia. Coccydynia is defined as pain that occurs in the coccyx at the moment of sitting or that occurs while sitting in the same position for a long period.3,4
The first stage of treatment comprises conservative modalities such as anti-inflammatory drugs, rest, seating support with a seating ring or a soft cushion, hot water baths, and local anesthetic or steroid injections. Following acute trauma, manipulation under anesthesia can be applied in addition to conservative methods. In the treatment of persistent coccydynia resistant to conservative treatment methods, successful results have been reported from coccygectomy. Although there are many reports in literature regarding the successful results of total coccygectomy in the surgical treatment of chronic coccydynia, the data on the clinical results of partial coccygectomy are limited. The aim of this study was to evaluate the results of partial and total coccygectomy for chronic coccydynia and to evaluate the efficacy of the two surgical methods.

Patients and methods

After obtaining approval from the Adana Numune Research and Educational Hospital institutional review board (IRB) (decision no: 21, dated February 24, 2017), the study included 22 patients (from a total of 27) who underwent partial or total coccygectomy because of persistent coccydynia between December 2007 and January 2014. Informed consent form was obtained from all patients. There were 15 females and 7 males with a mean age of 33.6 years (range 23–46 years). The indication of coccygectomy was defined as symptomatic coccydynia for at least 1 year and had been unresponsive to conservative treatments for at least 6 months. There was a history of trauma in the etiology of all the patients. In 2 patients, there was a history of suspected trauma, and for these 2 patients, differential diagnosis was made from magnetic resonance imaging (MRI). All patients were called for examination to obtain feedback. They were evaluated with respect to whether or not there were clinical complaints, sensitivity in the coccyx region, and duration of pain-free sitting. Radiological evaluation was made from anteroposterior and lateral coccyx radiographs. Pre- and postoperative pain levels were evaluated by using the visual analog scale (VAS) scores, where patients grade the pain from 0 to 10 (0 = no pain, 10 = intolerable pain). Those with complete pain relief were evaluated as very good (0–1 points), those with recovery of most of the pain and only a slight pain when sitting for long periods as good (2–3 points), those with a slight decrease in pain as moderate (4–6), and those with the same level of pain as preoperatively or a worsening of the pain level as poor (≥7 points) results. Finally, the patients were asked if they were satisfied with the result of the operation.

Conservative treatment was applied as intermittent anti-inflammatory therapy, a change in sitting habits for at least 6 months, the use of a soft cushion or a seating ring, hot water baths, and at least one application of combined local anesthetic and steroid injection (40 mg methylprednisolone acetate 20 mg/mL, 1 cc prilocaine HCl). The patients were classified according to the Postacchini and Massobrio classification. The distribution of the patients according to the type of operation and the Postacchini Massobrio groups is shown in Table 1. Partial coccygectomy was performed in 14 patients and total coccygectomy in 8. All the operations were performed by a single experienced surgeon (SZ). The mean follow-up period was 28 months (range 16–48 months).

Surgical technique

All the patients were operated under general anesthesia in the prone position. Preoperatively, antibiotic prophylaxis (2 g cefazolin Na intravenous [IV]) was administered to all patients. The gluteal regions were pulled laterally with adhesive drapes. In the patients undergoing partial excision, a longitudinal incision of ~3 cm was made in the coccyx midline, and the painful and hypermobile segment was excised from the soft tissue with the surgical technique described by Key. Briefly, by sharp dissection, the posterior surface of the coccyx is exposed as much as possible. If it is bent forward, the tip cannot be exposed until later. After the posterior surface of the coccyx has been well exposed, the posterior part of the intervertebral disk between the coccyx and the sacrum is cut with a knife. The ligaments between the inferior part of the sacrum and the first segment of the coccyx are then carefully cut away.

Table 1 Distribution of patients according to gender, type of operation, and Postacchini Massobrio groups

<table>
<thead>
<tr>
<th>Gender/group</th>
<th>Operation type</th>
<th>Partial excision</th>
<th>Total excision</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Gender</td>
<td>n</td>
<td>%</td>
<td>n</td>
</tr>
<tr>
<td>Female</td>
<td>10</td>
<td>71.4</td>
<td>5</td>
<td>62.5</td>
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<tr>
<td>Male</td>
<td>4</td>
<td>28.6</td>
<td>3</td>
<td>37.5</td>
</tr>
<tr>
<td>Total</td>
<td>14</td>
<td>100.0</td>
<td>8</td>
<td>100.0</td>
</tr>
<tr>
<td>Postacchini Massobrio group</td>
<td>Type 1</td>
<td>3</td>
<td>21.4</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Type 2</td>
<td>7</td>
<td>50.0</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Type 3</td>
<td>4</td>
<td>28.6</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Type 4</td>
<td>0</td>
<td>0.0</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>14</td>
<td>100.0</td>
<td>8</td>
<td>100.0</td>
</tr>
</tbody>
</table>
from the coccyx. After the lateral part of the first segment is freed, it is grasped with a towel clip and, by twisting it from side to side, the remaining attachments to the sacrum are put on tension and cut with a knife. The coccyx is then pulled gently backward – that is, in the direction tending to pull it out of the wound – and, by sharp dissection with a knife, the aponeurotic fibers are cut from its lateral borders, and the tissues are cut from its deep surface. The coccyx was elevated and held with a clothes-peg clamp. It was excised by dissection from the rectum and soft tissue in a craniocaudal direction (Figures 3 and 4). In the postoperative period, taking the healing period of soft tissue into consideration, it was recommended to use a seating cushion for 2 weeks. The antibiotic prophylaxis was continued for 48 hours. No special diet was applied postoperatively, but fiber-rich intake was recommended to prevent constipation.

The VAS scores of the patients were evaluated at 6 months, 12 months, and the final follow-up examination postoperatively. The degree of relief in the painful area

![Figure 1 Partial excision preoperative images.](image1)

![Figure 2 Partial excision postoperative images and excised coccygeal segment.](image2)

![Figure 3 Total excision preoperative view.](image3)

![Figure 4 Total excision postoperative view.](image4)
compared to the preoperative values, how long the patient
could sit before the onset of pain, and the level of pain relief
in daily work and social life were evaluated.

Statistical analysis
The analysis of the study data was made with SPSS 20 soft-
ware (IBM Corporation, Armonk, NY, USA). Conformity to
normal distribution of unit numbers was assessed with the
Shapiro–Wilk test. In the interpretation of the results, the sig-
nificance level of 0.05 was used: a value of $p<0.05$ indicated
that variables were not of normal distribution and $p>0.05$ indi-
cated normal distribution of the variables. In the examination
of differences between groups where the variables were not
normally distributed, the Mann–Whitney $U$ test was applied.
The correlations between variables not of normal distribution
were examined with Spearman’s correlation analysis. A value
of $p>0.05$ was accepted as statistically significant.

Results
In the total excision, the mean VAS scores group were
8.88±0.64 preoperatively, 3.2±2.13 at 6 months, and 2.5±2.67
at the 1 year and final postoperative follow-up examinations.
In the partial excision group, these values were 8.79±0.89
preoperatively and 2.5±2.85 from 6 months onward postop-
eratively. No statistically significant difference was deter-
mined between the two groups with respect to the mean
scores ($p>0.005$, Table 2).

In the partial excision group, excellent results were
obtained in 9 patients, good in 2, moderate in 2, and poor
in 1. The ratio of excellent and good results was 78.5%. In
the total excision group, excellent results were obtained
in 5 patients, good in 1, moderate in 1, and poor in 1. The
ratio of excellent and good results was 75%. According to
the Postacchini Massobrio classification, the 2 patients with
moderate results in the partial excision group were Types 2
and 3 and the 1 patient with a poor result was Type 1. In the
total excision group, the patient with a moderate result was
Type 3 and the patient with a poor result was Type 2.

When all the patients were evaluated as a whole, a signifi-
cant reduction was determined in the clinical complaints of
20 of the 22 patients. Excellent results were obtained in 14
patients, good in 3, moderate in 3, and poor in 2. Excellent
and good results were seen in 17 (78%) patients. Excellent
and good results were obtained in 11 of the 14 patients in the
partial excision group and in 6 of the 8 patients in the total
excision group (Table 3). When the patients were asked if
they were satisfied with the result of the operation, a positive
response was obtained from 20 (90%) of 22 patients.

No wound site infection was observed in the partial exci-
sion group. In 2 patients in the total excision group, superfi-
cial wound infection responded well to oral antibiotic therapy.
No surgical debridement was necessary in any patient, and
no rectum injury was seen in any case.

The mean operating time was 50±5.18 min (range
40–60 min) in the total excision group and 35±4.87 min
(range 25–40 min) in the partial excision group (Table 4).

Discussion
Patients with coccydynia are often seen in daily orthopedic
practice. These patients are usually treated conservatively,
and in treatment-resistant patients or those who have been
neglected, the pain can become chronic. Follow-up of con-
servative treatment is important in forming the first stage
of treatment.10–14 However, patients suffering with chronic
pain that is unresponsive to conservative treatment should
be informed that surgical treatment provides pleasing results
and increases comfort.5,7,14 As there is no completely objective
evaluation system that can be used to evaluate the results of
coccyx surgery, more subjective evaluation and the pain-
focused VAS system have been used in previous studies.12,14–19
In this study, the VAS pain scoring system was used.

In literature, excellent and good results have been reported
at rates of 60%–90% from coccygectomy because of chronic
coccydynia.15–18 Capar et al14 reported 83.3% excellent and
good results and Kerr et al13 reported 84.6%. Other studies
have reported rates of 84%16 and >90%,15 with Cebesoy et
al even reaching 100% success rate.8 In this study, using two
different surgical techniques, excellent and good results were
obtained in 78% according to the VAS scores and patient
satisfaction was stated at the rate of 90%.

### Table 2 The results relate to the difference between pre- and postoperative VAS scores and type of operation

<table>
<thead>
<tr>
<th>Operation type</th>
<th>VAS scores</th>
<th>N</th>
<th>Mean</th>
<th>Median</th>
<th>Min</th>
<th>Max</th>
<th>SD</th>
<th>Wilcoxon test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Partial excision</td>
<td>Preoperative</td>
<td>14</td>
<td>8.79</td>
<td>9</td>
<td>7</td>
<td>10</td>
<td>0.89</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>Postoperative</td>
<td>14</td>
<td>2.5</td>
<td>1.5</td>
<td>0</td>
<td>10</td>
<td>2.85</td>
<td>0</td>
</tr>
<tr>
<td>Total excision</td>
<td>Preoperative</td>
<td>8</td>
<td>8.88</td>
<td>9</td>
<td>8</td>
<td>10</td>
<td>0.64</td>
<td>4.5</td>
</tr>
<tr>
<td></td>
<td>Postoperative</td>
<td>8</td>
<td>2.5</td>
<td>1.5</td>
<td>0</td>
<td>8</td>
<td>2.67</td>
<td>0</td>
</tr>
</tbody>
</table>

**Abbreviations:** VAS, visual analog scale; Min, minimum; Max, maximum; SD, standard deviation.
Coccygectomy can be applied as total or partial.1,2,5,7,9 Some research studies have stated that total coccygectomy is effective, that rates of dissatisfaction are higher in partial coccygectomy, and that these may require revision surgery.6–9,19 In a comparative study by Ramirei et al,2 failure rates were higher in cases applied with partial coccygectomy, and in another study, 3 patients with an unsuccessful result were all patients who had undergone partial coccygectomy. In another study, it was reported that good results obtained in patients with partial excision were associated with a high rate of sacrococcygeal fusion seen in some populations, and this was the reason for patient satisfaction. It was stated that in patients with intercocygeal instability, if there is sacrococcygeal fusion, a good result can be obtained from partial excision.6

Sehirlioglu et al applied total or partial coccygectomy to a series of 74 patients because of traumatic coccydynia and although the revision rates were high in those applied with partial revision, it was recommended that both methods could be applied.5 In this study, there was no statistical difference with respect to time, as there was an insufficient number of patients with superficial infection, no statistically significant correlation could be made between infection and the type of operation. In terms of making clear conclusions, the low number of cases can be accepted as a limitation of this study.

### Conclusion

Consistent with the findings of previous studies in literature, successful results were obtained in this study from coccygectomy in the treatment of posttraumatic coccydynia unresponsive to conservative treatment. Thus, in patients with persistent coccydynia, it can be considered the mean operating time of the partial excision group was shorter. Although there was no difference between the two groups with respect to patient satisfaction, the operating time was shorter (mean 35 min) can be considered an advantage of partial excision.

In the differential diagnosis of traumatic coccydynia, evaluation with MRI may sometimes be necessary. Even if the coccyx appears normal, although taken in a supine position, MRI is useful in situations where the pain in the coccyx region could be due to bursitis, tumor, or disk pathologies. In this study, benefit was gained from MRI used in the differential diagnosis of 2 patients with a suspected trauma history.

### Table 3 Preoperative VAS status of the pre- and postoperative VAS scores

<table>
<thead>
<tr>
<th>VAS score</th>
<th>n</th>
<th>Mean</th>
<th>Median</th>
<th>Min</th>
<th>Max</th>
<th>SD</th>
<th>n</th>
<th>Mean</th>
<th>Median</th>
<th>Min</th>
<th>Max</th>
<th>SD</th>
<th>n</th>
<th>Mean</th>
<th>Median</th>
<th>Min</th>
<th>Max</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preoperative</td>
<td>22</td>
<td>8.82</td>
<td>9</td>
<td>7</td>
<td>10</td>
<td>0.8</td>
<td>22</td>
<td>8.82</td>
<td>9</td>
<td>7</td>
<td>10</td>
<td>0.8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Postoperative Excellent</td>
<td>14</td>
<td>8.79</td>
<td>9</td>
<td>7</td>
<td>10</td>
<td>0.89</td>
<td>3</td>
<td>8.33</td>
<td>8</td>
<td>8</td>
<td>9</td>
<td>0.58</td>
<td>3</td>
<td>9</td>
<td>9</td>
<td>9</td>
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<tr>
<td>Good</td>
<td>3</td>
<td>8.33</td>
<td>8</td>
<td>8</td>
<td>9</td>
<td>0</td>
<td>2</td>
<td>9.5</td>
<td>9</td>
<td>9</td>
<td>10</td>
<td>0.71</td>
<td>2</td>
<td>9.5</td>
<td>9</td>
<td>9</td>
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<td>0.71</td>
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<tr>
<td>Moderate</td>
<td>3</td>
<td>9</td>
<td>9</td>
<td>9</td>
<td>9</td>
<td>0</td>
<td>22</td>
<td>8.82</td>
<td>9</td>
<td>7</td>
<td>10</td>
<td>0.8</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Poor result</td>
<td>2</td>
<td>9.5</td>
<td>9</td>
<td>9</td>
<td>10</td>
<td>0.71</td>
<td>22</td>
<td>8.82</td>
<td>9</td>
<td>7</td>
<td>10</td>
<td>0.8</td>
<td></td>
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</table>

### Table 4 Results of the Mann–Whitney U test related to the difference in gender and operation type with respect to operating time

<table>
<thead>
<tr>
<th>Operation type/gender</th>
<th>Operating time (min)</th>
<th>Mann–Whitney U test</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>Median</td>
</tr>
<tr>
<td>Operation type</td>
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<td></td>
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<tr>
<td>Total excision</td>
<td>14</td>
<td>33.93</td>
</tr>
<tr>
<td>Partial excision</td>
<td>8</td>
<td>51.25</td>
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<tr>
<td>Total</td>
<td>22</td>
<td>40.23</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>15</td>
<td>40.67</td>
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<tr>
<td>Male</td>
<td>7</td>
<td>39.29</td>
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<tr>
<td>Total</td>
<td>22</td>
<td>40.23</td>
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</table>

**Abbreviations:** Min, minimum; Max, maximum; SD, standard deviation.
unnecessary to be too insistent on conservative treatment. Coccygectomy can be applied as total or partial with two different surgical methods. In this study, although there was no statistically significant difference between the 2 different surgical methods with respect to clinical results, both the shortness of the operating time and that it is a less invasive surgery, that is, partial coccygectomy can be considered as a surgical option with satisfactory results in patients with chronic coccydynia.

Disclosure

The authors report no conflicts of interest in this work.

References