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RESEARCH ARTICLE

Investigation of the Effect of Screw Fixation of Sacroiliac Luxation on Pelvic Canal Width Ratio in Cats

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Abstract

The aim of this study was to evaluate the pre- and postoperative effects of screw stabilization on the inter-ilium distance, pelvic canal width, and hemipelvic canal ratios in cats that developed sacroiliac luxation as a result of trauma. The study included 18 cats of different breeds, sexes, ages and weights that were diagnosed with sacroiliac luxation due to trauma and underwent surgical intervention at the Selcuk University Small Animal Hospital between 2023 and 2024. Clinical, hematological, and radiological examinations were performed. Following medical treatment and rehabilitation of the patients requiring stabilization before surgery, screw fixation was applied between the ilium and sacrum to stabilize the sacroiliac luxation. Among the 18 cases, 16.6% had bilateral sacroiliac luxation, 16.6% had sacroiliac luxation with an ilium fracture, 16.6% had sacroiliac luxation with an ischium fracture, 11.1% had sacroiliac luxation with a pubis fracture, 11.1% had sacroiliac luxation with both pubis and ischium fractures, 5.6% had sacroiliac luxation with an acetabulum fracture, 5.6% had sacroiliac luxation with both acetabulum and ilium fractures, 5.6% had sacroiliac luxation with both ilium and ischium fractures, 5.6% had sacroiliac luxation with pubis and ilium fractures accompanied by femoral head luxation, and 5.6% had sacroiliac luxation with pubis, ilium, ischium, and symphysis pelvis fractures. In 84% of the 18 cases diagnosed with sacroiliac luxation and treated surgically, the postoperative pelvic canal width ratio (PCWR) was found to be ≥1.1. No statistically significant difference was observed between the pre- and postoperative inter-ilium distance and pelvic canal ratios. However, a statistically significant difference was found in the hemipelvic canal ratio between the pre- and postoperative measurements ($P<0.05$). In this study, the comparison of pre- and postoperative results showed that the inter-ilium distance, pelvic canal, and hemipelvic canal ratios approached a normal anatomical structure postoperatively. In the choice of surgical technique, the dorsal approach to expose the ilium body facilitated the application.

Key Words: Hemipelvic canal ratios, ilium distance, pelvic canal ration, screw fixation

Kedilerde Sakroiliak Luksasyonun Vida Fiksasyonu ile Tedavisinin Pelvik Kanal Genişliği Oranına Etkisinin Araştırılması

Öz

Bu çalışmanın amacı, travmalar sonucu sakroiliak çıkık gelişen kedilerde, vida stabilizasyonunun iki ilium arası mesafe, pelvik kanal genişliği ve hemipelvik kanal oranları üzerindeki etkilerini pre ve postoperatif olarak değerlendirmektir. Çalışma materyalini 2023-2024 yılları arasında Selçuk Üniversitesi, Küçük Hayvan Hastanesi'ne travma sonucu sakroiliak çıkık oluşan ve cerrahi girişim gerçekleştirilen farklı ırk, cinsiyet, yaş, ağırlıkta 18 kedi oluşturdu. Klinik, hemogram ve radyolojik muayeneleri yapıldı. Operasyon öncesi medikal tedaviye ihtiyaç duyan hastaların rehabilitasyonlarından sonra sakroiliak çıkıklarda ilium ile sakrum arasında vida stabilizasyonu yapıldı. 18 olgunun %16.6'sında bilateral sakroiliak çıkık, %16.6'sında sakroiliak çıkık beraberinde ilium kırığı, %16.6'sında sakroiliak çıkık beraberinde ischii kırığı, %11.1'inde sakroiliak çıkık beraberinde pubis kırığı, %11.1'inde sakroiliak çıkık beraberinde pubis ve ischii kırığı, %5.6'sında sakroiliak çıkık beraberinde acetabulum kırığı, %5.6'sında sakroiliak çıkık beraberinde acetabulum ve ilium kırığı, %5.6'sında sakroiliak çıkık beraberinde ilium ve ischii kırığı, %5.6'sında sakroiliak çıkık beraberinde pubis ile ilium kırığı ve caput femoris luksazyonu, %5.6'sında sakroiliak çıkık beraberinde pubis, ilium, ischii ve symphysis pelvina kırığı olduğu belirlendi. Sakroiliak çıkık teşhisi konulan ve cerrahi girişim uygulanan 18 olgunun %84'ünde operasyon sonrası pelvik kanal genişliği oranı (PKGO)≥1.1 olarak bulunmuştur. Cerrahi girişim öncesi ve sonrası iki ilium arası oran arasında ve pelvik kanal oranı arasında istatistiksel olarak anlamlı bir fark gözlenmedi. Ancak, operasyon öncesi ve sonrası hemipelvik kanal oranı arasında istatistiksel olarak anlamlı bir fark olduğu belirlendi ($P<0.05$). Yapılan çalışmada pre ve postoperatif sonuçlarının karşılaştırılmasında, iki ilium arası, pelvik kanal ve hemipelvik kanal oranları post-op dönemde sağlıklı anatomik yapıya yaklaştığı gözlendi. Seçilecek cerrahi teknikte, olguların corpus ilium'a dorsal yaklaşım ile açığa çıkarılması uygulama kolaylığı sağlamıştır.

Anahtar Kelimeler: Hemipelvik kanal oranları, ilium mesafesi, pelvik kanal oranları, vida fiksasyonu

INTRODUCTION

Pelvic fractures in cats account for approximately 32% of all fractures (1). Of these, 59-93% are associated with sacroiliac luxation, and 27-46% are bilateral (1-3). Sacroiliac luxation is the separation of the wing of ilium from the sacrum (4) and can sometimes be associated with sacral fractures (5). Unilateral sacroiliac dislocation can only occur with concomitant pelvic fractures due to the rigid structure of the pelvic ring (6). Common fracture combinations include sacroiliac dislocation with symphysis pubis separation, pubic bone, pubic bone combined with ischial fractures, sacroiliac dislocation with contralateral wing of ilium and pubic fractures (1,6). Although bilateral sacroiliac luxation can occur without concomitant pelvic injury, it is often associated with pubic fractures in cats (1). In a study of 103 feline pelvic fractures, it was found that 90% of the fractures occurred in the pelvic floor (Symphisis pubis, ischial, pubic body). Sixty percent of these cases were sacroiliac dislocations, and 48.5% were iliac fractures (3).

Initially, cage rest was recommended for the treatment of sacroiliac dislocation. However, more recent surgical interventions have been shown to lead to faster recovery times and to be more comfortable for the patient during both the recovery period and the postoperative period (7-9). Some researchers advocate surgical stabilization in all cases of sacroiliac joint dislocation, emphasizing that the sacroiliac joint is part of the weight-bearing axis of the pelvic limb (10,11). Furthermore, there is insufficient evidence to support conservative management of sacroiliac joint dislocation (1,11). Indications for conservative management include no need for patient assistance, less than 50% displacement of the articular surface, minimal pain and instability, no concomitant fractures along the weight bearing axis, absence of certain neurological problems and less than 45% narrowing of the pelvic canal (1,11-13).

Conservative management of sacroiliac luxation in cats typically involves cage rest for 2-4 weeks, analgesic management, and monitoring of urination and defecation (13). There are some reports of conservative management of sacroiliac luxation (1,14,15). In a retrospective study of 16 cats, good results were obtained after a short follow-up (4 weeks) and no lameness was observed (14). However, complications associated with conservative management include pelvic canal stenosis, displacement of pelvic fragments leading to constipation or obstipation (16), and prolonged recovery times (11). It has been suggested that ankylosis and degenerative changes may develop in the sacroiliac joint, adversely affecting mobility (17). Conservative treatment may be considered in cases of sacroiliac dislocation with minimal displacement. However, conditions that result in pelvic canal narrowing, pain that negatively affects the patient's quality of life, or displacement or neurological dysfunction that affects gait are indications for surgical stabilization (18,19).

Recently, surveys have been used to evaluate outcomes of surgically stabilized unilateral and bilateral sacroiliac luxation (20,21) and femoral head and neck resections in cats (22). Internal fixation as a surgical procedure reduces pain, hospital stay and postoperative recovery time (23). A single screw or two screws can be used for fixation. In addition, lag screws with Kirschner wire can be used (24,25).

The aim of this study is to evaluate the effects of screw stabilization on the iliopelvic distance, pelvic canal width and hemipelvic canal ratio in cats with sacroiliac luxation resulting from various traumas, comparing pre and postoperative results.

MATERIAL AND METHODS

The study was carried out on 18 cats of different breeds, sex, age and weight that were referred to the Small Animal Hospital of the Faculty of Veterinary Medicine of Selçuk University between 2023 and 2024 with a diagnosis of sacroiliac luxation due to various traumas and underwent surgical intervention (Table 1). Clinical, hemogram and radiological examinations were performed. If the cats were treated before surgery for any medical condition (infection, acidosis or alkalosis), and then screw stabilisation between the ilium and sacrum was performed for sacroiliac dislocations.

Table 1. Medical history of cats with sacroiliac dislocation due to various traumas and surgery of different breed, sex, age and weight

Number	Breeds	Genders	Age	Dislocation	Anamnesis
1	Turkish Angora	Female	3	Right	Falling down from height
2	Scottish Fold	Female	5	Bilateral	Falling down from height
3	British Shorthair	Male	2	Right	Traffic accident
4	Mixed breed	Male	3	Right	Falling down from height
5	Mixed Breed	Female	3	Left	High energy trauma
6	British Longhair	Male	2	Right	Falling down from height
7	Brazilian Shorthair	Female	4	Right	Traffic accident
8	Mixed Breed	Female	2	Right	Falling down from height
9	British Shorthair	Male	1	Bilateral	Falling down from height
10	Mixed Breed	Male	6	Right	Falling down from height
11	Mixed Breed	Male	8	Left	Traffic accident
12	Brazilian Shorthair	Female	6	Bilateral	Falling down from height
13	Mixed Breed	Female	5	Bilateral	Falling down from height
14	British Longhair	Female	9	Left	Falling down from height
15	Bombay	Male	2	Right	Falling down from height
16	British Shorthair	Male	2	Right	Falling down from height
17	Mixed Breed	Male	3	Bilateral	Falling down from height
18	British Shorthair	Male	5	Left	Falling down from height

Blood Examination

Blood collected from the cephalic vein. A Radiometer blood gas analyser (ABL90 series, Denmark) and a Biotecnica biochemical analyser (BT3000 Plus, Italy) were used for blood gas measurements.

Radiographic Examination

For radiographic examination, the Siemens single-tube fixed radiography unit (model: 483388, China) available in the clinic was used. Direct orthogonal radiographs were taken in ventro-dorsal, latero-lateral positions depending on the region of interest, preoperative and postoperative metric

measurements between the sacrum and the sagittal plane, as well as measurements between the acetabulum and the sagittal plane, were taken during the radiographic examination. Pelvic canal width ratio (PCWR): This is the ratio between the width of the pelvis in the cranial direction of the acetabulum and the caudal width of the sacrum. A PCWR ≥1.1 was considered normal (20). The preoperative pelvic canal ratio, the hemipelvic canal ratio and the distance between the iliac bones were measured for the cases.

Medical Treatment

As a result of the examination and analysis, medical treatment (infection, acidosis or alkalosis e.g) was given to patients with general health problems (trauma procedur e.g) and patients were prepared for surgery.

Surgical Procedure

Pre-anesthetic Domitor 80 µg/kg (Domitor®, Orion Pharma, Finland) was injected intramuscularly together with butorphanol 0.4 mg/kg (Butomidor® 10mg/ml, Richter-Pharma, Austria), an analgesic and sedative pre-anesthetic. Anaesthesia was induced with propofol (2-4 mg/kg) . After induction, the endotracheal tube was placed and anaesthesia was maintained with isoflurane (%1.5-4) Isoflurane 100 mL, Adeka İlaç, Türkiye) at a concentration of 1.5-1.8%.

Surgical approach to the ilium wing and the dorsal surface of the sacrum

Two methods were used to approach the iliac spine. First, the locations of the dorsal iliac spine and the caudal iliac spine on the lateral surface of the iliac body were determined. The caudal 1/3 of this area was considered and the point where it met the ventral iliac spine was calculated. Starting from the ilium wing, the area continuing to the corpus was divided into two equal parts. The junction of the region where the line from the dorsal iliac spine divides the iliac body was chosen as the ideal area for drilling. A screw of appropriate length (60% of sacrum lenght) was advanced until its tip was on the medial surface of the ilium. The ilium was aligned caudally with the articular surface of the sacroiliac joint. The tip of the screw was directed into the pre-prepared groove hole in the sacrum and the screw was tightened.

Dorsal approach to the ilium body

A dorsal approach was used to access the body of the ilium, allowing exposure of L7, the sacrum, and the luxation site. The incision started cranially at the dorsal iliac spine and continued caudally in a line parallel to the midline towards the hip joint. The sacroiliac joint was exposed and Hoffman elevator were used to enter between the ilium and sacrum. The fibrous cartilaginous articular surfaces of the sacrum were exposed. A hole was made 2 mm cranially and 2 mm proximal to the center of the articular cartilage. The depth of the hole in the sacral corpus was adjusted to allow the tip of the screw to extend to the median line of the corpus sacrum. Radiographs were taken before completion of surgery to assess the position of the screws.

Statistical Analysis

The Shapiro-Wilk test was applied and the normality assumption was found to be satisfied (P>0.05). This result indicates that the data followed a normal distribution. Therefore, paired sample t-tests were used to compare the means of the preoperative and postoperative results.

RESULTS

Clinical Results

The sex distribution of the cats that underwent surgery was as follows: 55.6% males and 44.4% females. In terms of breed distribution, 50% of the cats were mixed breed (Tabby), 33.4% were British Shorthair, 5.6% were Scottish Fold, 5.6% were Bombay, and 5.6% were Ankara cats. Postoperative clinical follow-up of the cases in this study showed a good prognosis. There were no problems with neurological dysfunction, defecation or urination.

Radiological Results

In the 18 cases diagnosed with sacroiliac dislocation, the distribution of associated fractures and dislocations was as follows 16.6% had bilateral sacroiliac luxation, 16.6% had sacroiliac luxation with an ilium body fracture, 16.6% had sacroiliac luxation with an ischial fracture, 11.1% had sacroiliac luxation with an pubic bone fracture, 11.1% had sacroiliac luxation with both pubis and ischium fractures, 5.6% had sacroiliac luxation with an acetabular fracture, 5.6% had sacroiliac luxation with both acetabular and iliac fractures, 5.6% had sacroiliac luxation with both iliac and ischium fractures, 5.6% had sacroiliac luxation with pubic and iliac fracture and femoral head luxation, 5.6% had sacroiliac luxation with pubis, ilium, ischium and pelvic symphysis fractures.

Preoperative and postoperative measurements of sacrum-sagittal distance, acetabulum-sagittal distance and pelvic canal width ratio (PCWR) are shown in Figures 1, 2 and 3 and Table 2.

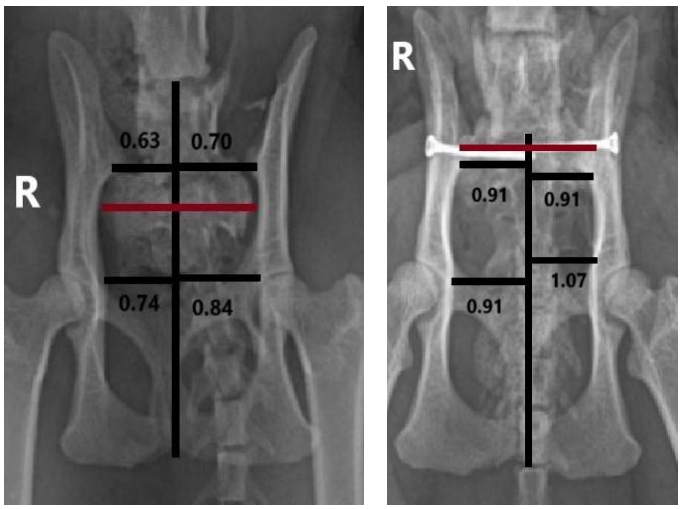

Figure 1. Pre and postoperative images of the 12th case with a bilateral luxation of the right sacroiliac joint.

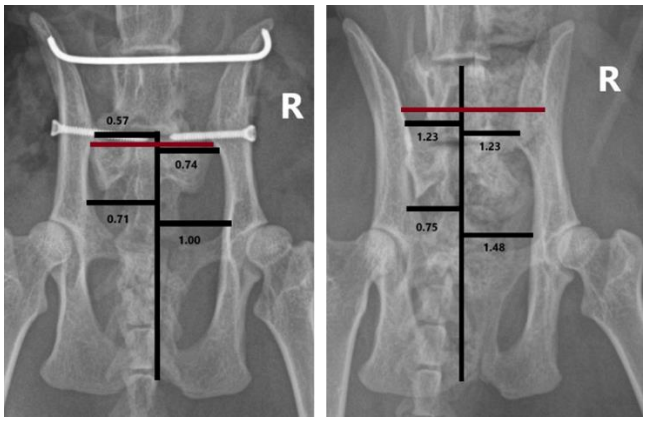

Figure 2. Pre and postoperative images of the 2th case with a bilateral sacroiliac joint luxation and a fracture of the pubic bone.

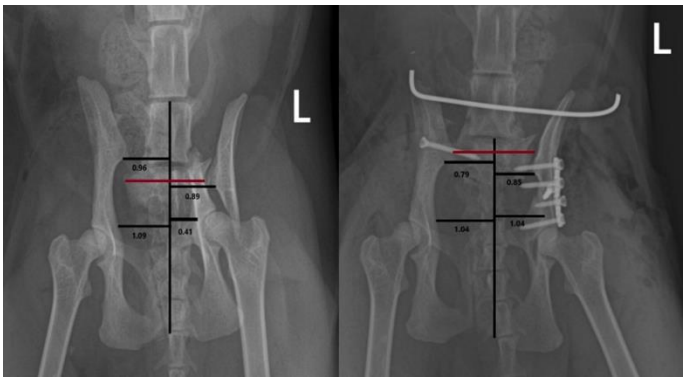

Figure 3. Pre and postoperative images of the 13th case with bilateral sacroiliac luxation and left ilium fracture

Table 2. Preoperative and postoperative sacrum-sagittal plane distance, acetabulum-sagittal plane distance, and pelvic canal width ratio (PCWR) values of the cases.

No	Preoperative sacrum-sagittal plane distance (R\L)	Postoperative sacrum-sagittal plane distance (R\L)	Preoperative acetabulum-sagittal plane distance (R\L)	Postoperative acetabulum-sagittal plane distance (R\L)	Preoperative (PCWR)	Postoperative (PCWR)
1	0.84\0.42	0.79\0.74	0.88\0.81	0.96\0.81	1.34	1.16
2	1.23\1.23	0.74\0.57	1.48\0.75	1.00\0.71	0.9	1.3
3	0.93\0.58	0.90\0.49	1.07\0.88	1.02\0.83	1.15	1.33
4	1.39\0.96	1.40\1.35	1.64\1.05	1.19\1.72	1.14	1.05
5	0.64\0.86	0.88\0.84	0.88\0.24	1.02\1.06	0.75	1.20
6	1.48\1.14	0.67\0.72	1.95\1.00	0.48\0.88	1.13	0.98
7	0.84\0.47	0.76\0.68	0.79\0.67	0.40\0.74	1.11	0.8
8	1.03\0.56	0.61\0.61	0.91\0.63	0.72\0.82	0.97	1.26
9	1.07\0.91	1.16\1.09	1.16\0.89	1.35\1.18	1.04	1.12
10	0.66\0.48	0.67\0.67	0.68\0.45	0.59\0.71	1	0.98
11	0.81\0.74	1.39\1.53	0.77\1.01	1.77\1.80	1.15	1.2
12	0.63\0.70	0.91\0.91	0.74\0.84	0.91\1.07	1.19	1.09
13	0.96\0.89	0.79\0.85	1.09\0.41	1.04\1.04	0.81	1.27
14	0.96\1.23	1.12\1.37	1.07\1.46	1.58\1.54	1.56	1.25
15	0.82\0.64	1.02\1.00	0.73\0.87	1.29\0.95	1.11	1.11
16	1.23\1.17	0.76\0.61	1.44\0.54	0.89\0.91	0.83	1.31
17	0.93\0.84	1.38\1.51	1.09\0.46	1.52\1.78	0.88	1.14
18	1.12\1.91	1.16\1.24	1.19\1.98	1.54\1.67	1.05	1.34

Preoperative pelvic canal ratio, hemipelvic canal ratio and distance between the iliums of the cases (Table 3). Postoperative pelvic canal ratio, hemipelvic canal ratio and distance between the iliums of the cases (Table 4). There was no statistically significant difference between the pre and postoperative distance between the two iliums ($p > 0.05$). Similarly, there was no statistically significant difference between the pre and postoperative pelvic canal ratio ($P>0.05$). However, a statistically significant difference was found between the pre- and post-operative hemipelvic canal ratio ($P<0.05$) (Table 5).

However, when evaluating the radiographic measurements of pre and postoperative pelvic canal ratio, hemipelvic canal ratio and inter-ilium distance, a return to normal anatomical structure between the right and left ilium was observed in all cases before and after surgery, although no statistically significant difference was found ($P>0.05$). No statistically significant difference was found in the pelvic canal ratio before and after surgery ($P>0.05$). However, a statistically significant difference was observed in the hemipelvic canal ratio before and after surgery ($P<0.05$). In addition, postoperative radiological follow-up of sacroiliac dislocation cases showed good anatomical alignment. Although there was no statistical change between the pre- and post-operative inter-ilium ratios, a reduction in the post-operative average was observed. The pelvic canal ratio (distance from the sacrum to the ilium) was 1.06 cm preoperatively and 1.16 cm postoperatively, showing no statistical difference but a recorded increase. A statistically significant difference was found in the acetabulum/midline ratio pre- and post-operatively ($P<0.01$).

Table 3. The preoperative pelvic canal ratio, hemipelvic canal ratio, and distance between iliums of the cases are presented

Case No	Distance between iliums (R\L)	Pelvic canal ratio	Hemipelvic canal ratio (R\L)
1	0.84\0.42= 2	1.69\1.26= 1.56	0.88\0.81= 1.08
2	1.23\1.23= 1	2.23\2.46= 0.91	1.48\0.75= 1.97
3	0.93\0.58= 1.6	1.95\1.51= 1.3	1.07\0.88= 1.2
4	1.39\0.96= 1.45	2.69\2.35= 1.14	1.64\1.05= 1.56
5	0.64\0.86= 0.74	1.12\1.5= 0.75	0.88\0.24= 3.7
6	1.48\1.14= 1.3	2.95\2.62= 1.13	1.95\1.00= 1.95
7	0.84\0.47= 1.8	1.46\1.31= 1.11	0.79\0.67= 1.18
8	1.03\0.56= 1.8	1.54\1.59= 0.97	0.91\0.63= 1.4
9	1.07\0.91= 1.18	2.05\1.98= 1.04	1.16\0.89= 1.3
10	0.66\0.48= 1.38	1.13\1.14= 0.99	0.68\0.45= 1.5
11	0.81\0.74= 1.09	1.78\1.55= 1.15	0.77\1.01= 0.76
12	0.63\0.70= 0.9	1.58\1.33= 1.19	0.74\0.84= 0.88
13	0.96\0.89=1.08	1.5\1.85= 0.81	1.09\0.41= 2.66
14	0.96\1.23= 0.8	2.53\2.19= 1.16	1.07\1.46= 0.73
15	0.82\0.64= 1.3	1.6\1.46= 1.10	0.73\0.87= 0.84
16	1.23\1.17= 1.05	1.98\2.4= 0.83	1.44\0.54= 2.7
17	0.93\0.84= 1.1	1.55\1.77= 0.88	1.09\0.46= 2.37
18	1.12\1.91= 0.59	3.17\3.03= 1.05	1.19\1.98= 0.6
Mean	1.231 ± 0.387	1.059 ± 0.194	1.577 ± 0.836

Table 4. The postoperative pelvic canal ratio, hemipelvic canal ratio and distance between iliums of the cases are presented

Case No	Distance between iliums (R\L)	Pelvic canal ratio	Hemipelvic canal ratio (R\L)
1	0.79\0.74= 1.07	1.77\1.53= 1.16	0.96\0.81= 1.19
2	0.74\0.57= 1.30	1.71\1.31= 1.30	1.00\0.71= 1.40
3	0.90\0.49= 1.83	1.85\1.39= 1.33	1.02\0.83= 1.23
4	1.40\1.35= 1.04	2.91\2.75= 1.06	1.19\1.72= 0.70
5	0.88\0.84= 1.05	2.08\1.72= 1.21	1.02\1.06= 0.96
6	0.67\0.72= 0.93	1.36\1.39= 0.98	0.48\0.88= 0.55
7	0.76\0.68= 1.12	1.14\1.44= 0.80	0.40\0.74= 0.54
8	0.61\0.61= 1	1.54\1.22= 1.26	0.72\0.82= 0.88
9	1.16\1.09= 1.06	2.53\2.25= 1.12	1.35\1.18= 1.14
10	0.67\0.67= 1	1.3\1.34= 0.97	0.59\0.71= 0.83
11	1.39\1.53= 0.9	3.57\2.92= 1.22	1.77\1.80= 0.98
12	0.91\0.91= 1	1.98\1.82= 1.09	0.91\1.07= 0.85
13	0.79\0.85= 0.93	2.08\1.64= 1.27	1.04\1.04= 1
14	1.12\1.37= 0.82	3.12\2.49= 1.25	1.58\1.54= 1.03
15	1.02\1.00= = 1.02	2.24\2.02= 1.11	1.29\0.95= 1.36
16	0.76\0.61= 1.25	1.8\1.37= 1.31	0.89\0.91= 0.98
17	1.38\1.51= 0.91	3.3\2.89= 1.14	1.52\1.78= 0.85
18	1.16\1.24= 0.94	3.21\2.4= 1.34	1.54\1.67= 0.92
Mean	1.065 ± 0.224	1.162 ± 0.145	0.966 ± 0.240

Table 5. A comparison of the ratio between the two iliums. The ratio between the sacrum and ilium and the ratio between the acetabulum and the midline before and after surgery is presented

	Preoperative			Postoperative		
	n	Average	Std. Deviation	Ave-rage	Std. Deviation	p-value
Distance between iliums	18	1.23	0.387	1.07	0.224	0.085
Pelvic canal ratio (ratio between the sacrum and ilium)	18	1.06	0.194	1.16	0.145	0.114
Hemipelvic canal ratio (ratio between the acetabulum and the midline)	18	1.58	0.836	0.97	0.240	0.010*

* P<0.05. Paired samples t-test

Postoperative Surgical Findings

The lateral surface of the ilium body was identified along with the points of the cranial and caudal dorsal iliac spine. The caudal 1/3 of this region was considered and its junction with the ventral iliac spine was calculated. In cases where the screws were misplaced, the screw placement was re-evaluated. A dorsal approach to the body of ilium exposed the dorsal and midline of L7, the sacrum and its dislocations. As the fibrous cartilaginous articular surfaces between the articular joint and the sacrum were exposed and visible, screw placement was more precise. In all 18 cases, the clinical course remained with no complications.

DISCUSSION AND CONCLUSION

In cats with sacroiliac luxation, even in cases where surgery may be beneficial, clinicians tend to favour conservative management. This is based on the belief that cats have a better prognosis for recovery from such injuries than dogs (26,27). Surgical procedures are potentially difficult due to the anatomical structure of the feline sacrum. In previous years, conservative management was generally considered the preferred and sufficient option for pelvic fractures in cats (11,14,27). The belief that cats can successfully cope with such injuries and that the traditional repair method of sacroiliac dislocation is technically challenging and risky has influenced this decision (27). In a retrospective study, Bennett (14) reported good functional outcomes in most cases after conservative treatment, with no significant lameness observed at four weeks. However, complications of conservative management included dislocation of pelvic fragments, pelvic canal stenosis and constipation or obstipation (16). However, according to Langley-Hobbs (17), although the prognosis appears good after conservative treatment in cats, ankylosis of one or both sacroiliac joints and degenerative changes in the lumbosacral joint often develop. This is thought to be due to altered force transmission and compensatory overload (26). Surgical stabilisation of sacroiliac luxations is advocated as it provides early pain relief and improves patient comfort (23,28). As 58.6% of cats with pelvic fractures also have concomitant musculoskeletal injuries, these factors are particularly important (26). Long-term studies evaluating the quality of life in cats with sacroiliac luxation treated conservatively and surgically are lacking (11). In addition, although few cats present with lameness after conservative treatment, a large number develop degenerative osteoarthritis in the affected sacroiliac joint, contralateral sacroiliac joint and lumbosacral joint due to altered force transmission and compensation (26). Surgical fixation of sacroiliac dislocations restores normal pelvic anatomy and establishes a strong connection between the appendicular and axial skeleton, ensuring normal alignment of force transmission and facilitating early pain-free walking (29,30).

In this study, surgery was preferred for sacroiliac dislocation. Surgical repair of sacroiliac dislocation has advantages, including early pain relief, less narrowing of the pelvic canal, relief of compression of organs passing through the pelvic canal, and reduction of pressure on the sciatic nerve. Nerve damage has been reported to heal in 81% of patients with pelvic fractures and sacroiliac dislocations (11). Rare postoperative complications include repair failure, nerve damage, bladder control problems and fecal incontinence (29). In this study, one of the approaches used to expose the sacroiliac joint was a dorsal and lateral approach to the ilium. A small Hohmann retractor was used to lift down the ilium wing ventrally, exposing the articular surface of the sacral wing. The iliac-directed drill was aimed to reach the articular surface of the sacrum for screw stabilization. The screws used were positioned to cover approximately 60% of the space between the two ilia. After application, radiographs were taken before closing the surgical site and the screws were checked for proper placement. If the screws did not exert pressure on the anatomical region, a second screw was used for stabilisation. Screws that were not in the desired plane were removed and repositioned. In cases where a lateral iliac approach was used, although the anatomical region of the ilium was correctly identified, there was a higher chance of missing the articular surface of the sacrum body due to the risk of displacement from trauma. Similar results have been reported in previous studies (8,9).

When drilling the ilium in cats, it has been shown that the drill point is not a useful indicator for determining the location of the screw hole in the sacral wing. Correct placement of the drill hole at the first attempt is critical because the space available for correct screw placement is much smaller than the implant itself. The average size of this area is less than 0.5 cm^2, which is approximately 25% of the articular surface of the sacral wing. Any further intervention reduces the chances of obtaining a solid drill hole with good bone purchase for the screw. To reduce the risk of incorrect screw placement, a pilot hole was first made with a small diameter Kirschner wire (2,28,31,32). As postoperative radiographs were taken, faulty implants were corrected. In previous studies, screw placement was considered excellent if at least 60% of the sacral application was achieved, protecting the vertebral canal (8,9). The low rate of vertebral canal penetration observed in this study may be explained by the accurate calculation of the anatomical region of the ilium and the use of small diameter screws, which reduced the risk of vertebral canal penetration in the small safe area.

As there was no non-surgical group in this study, it is difficult to objectively state that surgical repair of sacroiliac dislocation results in faster recovery compared to conservative approaches in cats. However, studies have reported that minimally displaced sacroiliac dislocations can be managed conservatively with good results (30). In cases of sacroiliac dislocation, surgical stabilization should be performed if there is moderate to severe displacement of the pelvis from the sacrum, if both the left and right sacroiliac joints are luxated, or if there are symptoms suggestive of sciatic nerve involvement. If the function of the sciatic nerve is compromised, surgery should be performed as soon as possible to reduce pressure on the nerve, which will help prevent permanent damage (33). In the cases in this study, preoperative neurological examination revealed a decrease in sciatic nerve reflexes. However, postoperative reflexes returned and normal leg function was observed. Restoration of neurological signs is considered to be the most reliable prognostic indicator in cats with sacrococcygeal dislocation, and normalisation of urinary function is a sign that the process is progressing positively. Previous studies support these findings (29). Furthermore, the results of single and double

screw stabilisation were found to be consistent with recent studies (34,35).

Postoperative clinical evaluations indicated a favorable recovery in all cases, with no signs of neurological issues or problems related to defecation or urination. Radiographic assessments revealed that the anatomical alignment between the right and left ilium improved after surgery. While some measurements showed no statistically significant changes, there was a noticeable improvement in overall pelvic alignment. Radiological follow-ups confirmed proper anatomical positioning, and certain parameters demonstrated meaningful differences after surgery, suggesting that screw fixation contributed to restoring a more normal pelvic structure. The absence of constipation was considered an important clinical outcome. In addition, the pelvic canal diameter ratio provides an indication that pelvic canal width has been restored after pelvic injury repair (36). It has been reported that the normal pelvic canal diameter ratio in dogs and cats is ≥1.1 (37). In the cases in this study, 84% had a pelvic canal diameter greater than 1.1, while the remaining 16% were close to this value. The pre- and post-operative rates of pelvic canal narrowing were closely related to the surgical procedure performed.

In conclusion, it is believed that surgical fixation in cats with sacroiliac luxations will restore normal pelvic anatomy and the strong connection between the appendicular and axial skeleton, thus ensuring normal alignment of force transmission and facilitating early pain-free walking. Neurological problems will be alleviated and the urinary and excretory systems will function normally. Although positive developments were observed in the pre and post-operative results of inter-ilium distance, pelvic canal ratio and hemipelvic canal ratio, no statistical differences were found in some parameters. This suggests that an increase in the number of cases should be considered. In the chosen surgical technique, the dorsal exposure of the iliac body allows for easier identification of the articular joint and the fibrous cartilaginous articular surfaces of the sacrum, thus facilitating the procedure. Additionally, It was also recommended that non-surgical groups be included in the evaluation to increase the power of the study.

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CONFLICT OF INTEREST

The authors have no conflicts of interest to report.

AUTHOR CONTRIBUTIONS

In this study. the research design and study planning were determined by MA and NZE. Data collection were conducted by IS, HES, ZC.

ETHICAL STATEMENT

An approval report for the proposed project was obtained from the Ethical Committee for Laboratory Animal Production and Research Centre of Selçuk University Faculty of Veterinary Medicine (SÜVDAMEK), and the study was started according to the approval report (dated 30.01.2025, meeting number 2025/2, decision number 2025/18). Informed consent forms were obtained from all animal owners before the animals were enrolled in the study.

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