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Retrospective Study on Surgical Repair of 31 Canine Pelvic Fracture Cases

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Abstract : The results of surgical repair for pelvic factures in 31 dogs were reviewed. Lameness and weight bearing scores were used to evaluate functional recovery of the hind limbs. Simple fracture occurred in sacroiliac joint (n = 5) and ilium (n = 3). Pelvic fractures had acetabular (n = 7) and non-acetabular fractures (n = 23). Acetabular fracture cases were composed of additional surgical treatments with femoral head and neck ostectomy (FHNO) (n = 4) and only acetabular rim fixation (n = 3). Simple fractures had more rapid initial and complete recovery times than multiple fractures. Non-acetabular fracture cases (initial recovery time: 2.7 weeks, complete recovery time: 9.1 weeks) had more rapid initial and complete recovery times than acetabular fracture cases (8.4, 12.5 weeks) ($p < 0.05$). In addition, the cases of additional surgical treatment with FHNO (5.3, 7 weeks) had more rapid mean recovery times than surgical treatment without FHNO (11.1, 16.3 weeks). Surgical approach with FHNO in acetabular fracture was an alternative method to treat pelvic fractures in small breed dogs.

Key words **:** pelvic fracture, FHNO, acetabulum, dog.

Introduction

The most common criteria for recommending surgical repair of a pelvic fracture include the following: displaced acetabular fractures, especially involving the cranial 2/3 of the acetabulum; greater than 1/3 narrowing of the pelvic canal diameter by fracture fragments; neurologic impairment, including intractable pain attributable to the fracture; ipsilateral fractures of the ilium, ischium, and pubis, resulting in an unstable hip joint; or contralateral orthopedic injuries requiring early weight-bearing on the pelvic fractures side (10,18). Recovery times after surgical repair at different fracture sites have been reported (3,6,11,13). However, there were few reports in which the results were compared with each fracture site and additional surgical approach was performed. The purpose of this study was to compare the recovery period of surgical repair with Femoral head and neck ostectomy (FHNO).

Materials and methods

Criteria for case selection

Medical records (2005-2011) and radiographs of thirty-one dogs that had stabilization of pelvic fractures were reviewed. The cases referred to the Veterinary Medicine Teaching Hospital of Seoul National University.

Surgical Technique

After an approach to the site, anatomical reduction and fixation with plates and screws were performed. In cases of sacroiliac luxation, surgical repair was accomplished by using long cortical screw. Plate was contoured to the ilium and the area of acetabular dorsal rim. The screw was inserted according to AO/ASIF recommendations. FHNO was performed at four acetabular fracture cases.

Clinical evaluation

Lameness and weight bearing scores were used to evaluate functional recovery of the hind limbs. Initial recovery time is the time point which is the first improvement of gait condition compared with pre-operative situation and complete recovery time is the time of improving to normal gait. The lameness score was divided into 5 grades, no lameness and normal stance (grade 0) to reluctance to walk or to rise stance (grade 4, Table 1)(9) and the weight bearing score was divided into 6 grades, weight bearing on postpad and against to compressing the lumbosacral region (grade 0) to non-weight bearing on the limb (grade 5, Table 2)(15).

Statistical analyses

Statistical analysis was performed using a statistical software program (SPSS version 18, SPSS, Inc., Chicago, IL,

Table 1. Lameness score

0	No lameness, normal stance
1	Lameness after exercise, normal stance
2	Slight lameness at a walk, normal stance
3	Severe lameness at a walk, abnormal stance
4	Reluctance to walk, reluctance to rise stance

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Table 2. Weight bearing score

0	Weight bearing on postpad, weight bearing against to compression
1	Weight bearing on postpad, non weight bearing against to compression
2	Weight bearing on forepad
3	Weight bearing on tip toe
4	Intermittent weight bearing on limb
5	Non-weight bearing on limb

USA). The mean recovery time of the pelvic fractures which had surgical treatments was compared using nonparametric statistics. Significance was assessed at $P < 0.05$

Results

Signalment

Thirty one patients consisted of several breeds, among them Yorkshire terrier (n = 8, 25.8%) was the most common breed, followed by Maltese (n = 7, 22.5%) and mixed (n = 5, 16.1%). Patient's body weight ranged from 1.2 kg to 13 kg (4.18 ± 2.44 kg) and, which were divided into 1-3 kg (n = 13, 41.9%), 3-6 kg (n = 14, 45.1%) and over 6 kg (n = 4, 12.9%). The patients ages were divided into under 1 year (n = 8, 25.8%), 1-3 years (n = 7, 22.5%), 3-5 year (n = 7, 22.5%), 5-7 years: (n = 5, 16.1%), over 7 years (n = 3, 9.6%) and one case was unknown. Fourteen dogs were male (45.1%, intact male: 10, neutered male: 4) and seventeen dogs were female (54.8%, intact female: 14, neutered female: 3). In our study, the most cause of the pelvic fractures was a traffic accident (30 cases, 91%) and the rest of reason was falling.

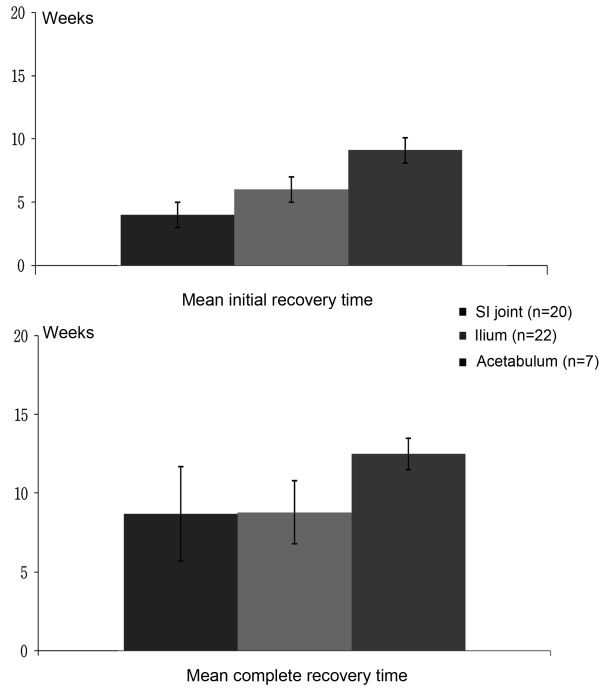

Fig 1. Initial and complete recovery times in relation to the fracture sites including sacroiliac joint (SI joint), ilium and acetabular fractures.

Fracture site

The initial and complete recovery times of twenty cases including sacro-iliac joint luxation or fractures, twenty-two cases including iliac fracture and seven cases including acetabular fractures after surgical treatments were 4.0 ± 2.5 and 8.7 ± 6.5 weeks, 6.0 ± 2.7 and 8.8 ± 4.4 weeks, and 9.1 ± 2.4 and 12.5 ± 8.6 weeks respectively (Fig 1).

Including acetabular fracture

Initial recovery time of non-acetabular fracture (n = 23) and acetabular fracture (n = 7) were 2.75 ± 1.4 weeks and 9.1 ± 2.4 weeks, respectively. Similar results were observed in complete recovery time, 8.4 ± 6.8 weeks and 12.5 ± 8.6 weeks respectively ($P < 0.05$) (Fig 2).

Femoral Head and Neck Ostectomy (FHNO)

Furthermore, acetabular fracture cases were divided by

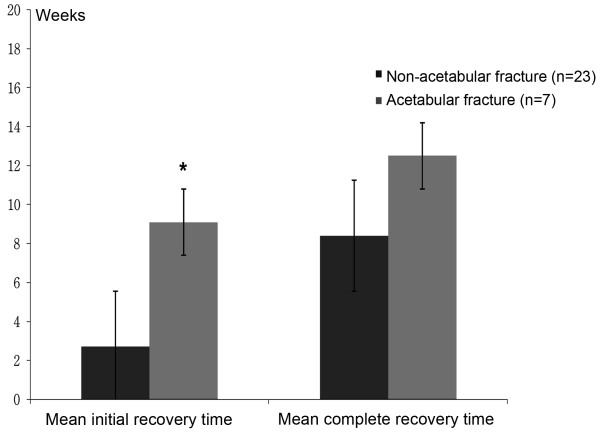

Fig 2. Initial and complete recovery times after surgical repair of non-acetabular and acetabular fractures: The values were represented with means ± standard deviation ($p < 0.05$).

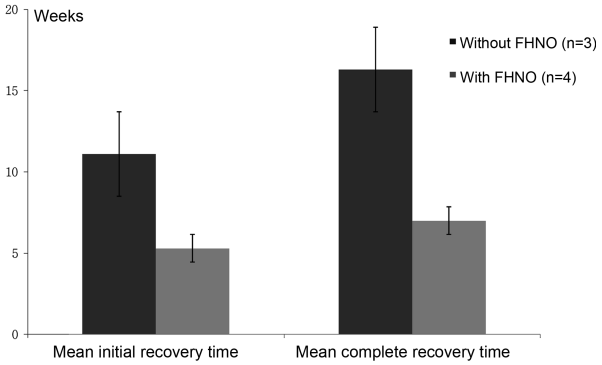

Fig 3. Initial and complete recovery times after surgical repair of acetabular fractures w/o femoral head and neck ostectomy (FHNO) or with FHNO.

whether FHNO was performed (n = 4) or not (n = 3). Initial recovery time of acetabular fractures with FHNO showed more shorten times (n = 4, 5.3 ± 2.4 weeks) than surgical treatment w/o FHNO (n = 3, 11.1 ± 1.5 weeks). Complete recovery time was more reduced in FHNO cases (7 ± 3.8 weeks) than w/o FHNO cases (16.3 ± 12.2 weeks) (Fig 3).

Discussion

The sites of pelvic fracture were classified under three headings: sacro-iliac joint, ilium, and acetabulum. Other fracture sites were ischium and pubis, but which fractures were rarely repaired surgically. It was reported that there was no significant difference of recovery time between the acetabular fractures treated with surgical repair and non-surgical repair (3,11). Previous studies showed that the recovery time for sacroiliac luxation or/and fractures, fractures of the ilium, and fractures of the acetabulum were 6 weeks, 3 weeks, 6 weeks respectively (6,8).

However in our study, acetabular fracture showed more delayed recovery time than non-acetabular fracture. Pelvic fracture including acetabular fracture also showed more delayed recovery time than other fracture sites in previous report (6). One of the reason was that acetabular fracture involving the cranial 2/3 of the acetabulum has been considered the weight-bearing region (7,10,17,19). The weight-bearing force works to the transverse intra-acetabular axis and produce distractive force at the dorsal surface of acetabulum (1,3,5,12,19). Furthermore, during surgical repair, exposure of surgical site may be difficult in acetabular fracture (2,4,14), and contouring of plates to the dorsal surface of acetabulum be difficult because of irregular conformation of the adjointing ischial surface (13,16,17). Additional surgical treatment with FHNO, in the repair of acetabular fracture, may help prevent abnormal abrasion and provide positive effect on recovery time because the weight bearing force that worked on the acetabulum was decreased by FHNO.

Additionally the two reoperation cases with acetabular fracture, which were excluded in the data because of the complications were treated with FHNO. They had also reduced initial and complete recovery periods (4.5 ± 3.53 weeks and 6.0 ± 2.82 weeks, respectively). Therefore, our study suggested that weight-bearing force to acetabulum was important factor of recovery time after surgical repair. It was suggested that the FHNO provided positive effect on recovery time, because the weight bearing force that affected to the acetabulum was decreased by FHNO.

In conclusion, surgical approach with FHNO in the pelvic fractures included acetabular fracture is an alternative method to treat pelvic fractures in small breed dogs.

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골반 골절의 수술적 교정을 실시한 31두 개에서의 후향연구

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요 약 : 본 조사는 골반골절을 수술적으로 교정한 31두 개에서의 결과를 분석한 것이다. 파행과 부중의 정도가 후지의 기능개선 평가에 이용되었다. 단순골절은 천장관절과 장골에서 발생하였으며, 골반골절은 관골절구의 골절을 포함하는 것과 포함하지 않는 경우가 있었다. 관골절구의 골절은 추가적인 대퇴골 머리 및 목 절제술 또는 관골절구 둘레 고정 만을 실시하였다. 단순골절은 복합골절에 비해 초기 회복시간과 완전한 회복시간 모두 짧았다. 관골절구를 포함하지 않는 골절에서는 포함한 골절에 비해 회복시간이 유의적으로 짧았다($p < 0.05$). 또한 대퇴골 머리 및 목 절제술을 추가로 실시한 경우에서 실시하지 않은 것 보다 짧은 회복시간을 보였다. 소형견에서 관골절구의 골절 발생 시 대퇴골 머리 및 목 절제술을 이용한 수술적 교정은 대체 가능한 방법으로 생각된다.

주요어 : 골반골절, 대퇴골 머리 및 목 절제술, 관골절구, 개