Floating Hip: Comparative Analysis of Outcomes and Associated Injuries

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ABSTRACT

Objective: We aim to describe the lengths of hospitalization, surgery, and rehabilitation of a series of patients with floating hip. As a secondary objective, to compare the outcomes obtained in terms of return to work in patients who had suffered fractures of the pelvis or acetabulum without an associated femoral fracture. **Materials and Methods:** Descriptive, retrospective, and multicenter study of patients with high-energy trauma to the pelvis and acetabulum divided into two study populations according to the presence of associated ipsilateral femur fracture (floating hip) for comparison, during the period January 2014 – March 2019. **Results:** 102 patients with pelvis and/or acetabulum trauma were included, grouped into 2 populations according to the presence of a floating hip (Floating hip: 23 patients; Pelvis/acetabulum: 79 patients). The median days of hospitalization [floating hip: median=15.5 (range=4-193); pelvis/acetabulum: 7 (3-31); p = 0.0001] and the number of surgeries per patient [FH: median = 5 (range = 3-8); pelvis/acetabulum: 2 (1-4); p = 0.0001] were higher in patients with floating hip. Additionally, temporary work disability was higher (p = 0.00012), with no significant differences in the rate of job retraining (p = 0.11). **Conclusion:** Floating hip significantly increased the length of hospitalization, necessary surgical procedures, and recovery times according to temporary work disability in patients with trauma to the pelvis and/or acetabulum.

Keywords: Floating hip; associated injuries; high energy trauma; pelvis; acetabulum.

Level of Evidence: III

Cadera flotante: análisis comparativo de resultados y lesiones asociadas

RESUMEN

Objetivo: Describir los tiempos de internación, cirugía y rehabilitación de una serie de pacientes con cadera flotante. El objetivo secundario fue comparar los resultados obtenidos en función de la reinserción laboral con los de pacientes que sufrieron fracturas de pelvis o acetábulo sin fractura femoral asociada. **Materiales y Métodos:** Estudio descriptivo, retrospectivo y multicéntrico de pacientes con trauma de pelvis y acetábulo de alta energía, divididos en dos grupos de estudio según la presencia de fractura de fémur asociada homolateral (cadera flotante) para su comparación, durante el período comprendido entre enero de 2014 y marzo de 2019. **Resultados:** Se incluyó a 102 pacientes con trauma de pelvis o acetábulo agrupados en 2 poblaciones según la presencia de cadera flotante (cadera flotante 23; pelvis/acetábulo 79). Las medianas de días de internación [cadera flotante 15,5 (rango 4-193); pelvis/acetábulo 7 (rango 3-31); p = 0,0001] y de la cantidad de cirugías por paciente [cadera flotante 5 (rango 3-8); pelvis/acetábulo 2 (rango 1-4); p = 0,0001] fueron mayores en los pacientes con cadera flotante. Además, la incapacidad laboral temporaria fue más alta (p = 0,00012), sin diferencias significativas en la tasa de recalificación laboral (p = 0,11). **Conclusión:** La asociación de la lesión cadera flotante aumentó significativamente el tiempo de internación, los procedimientos quirúrgicos necesarios y el tiempo de recuperación según la incapacidad laboral temporaria en pacientes con trauma de pelvis o acetábulo.

Palabras clave: Cadera flotante; lesiones asociadas; trauma de alta energía; pelvis, acetábulo.

Nivel de Evidencia: III

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INTRODUCTION

The term "floating" associated with a joint indicates a skeletal disruption above and below it, which may be intra-articular or extra-articular. This term was introduced by Blake and McBryde in 1975 to describe the floating knee.[1] In our case, we refer to a rare situation in which a fracture of the femur is involved with a fracture of the pelvis or ipsilateral acetabulum and that will require specific and sequential surgical treatment (Figures 1 and 2).[2]

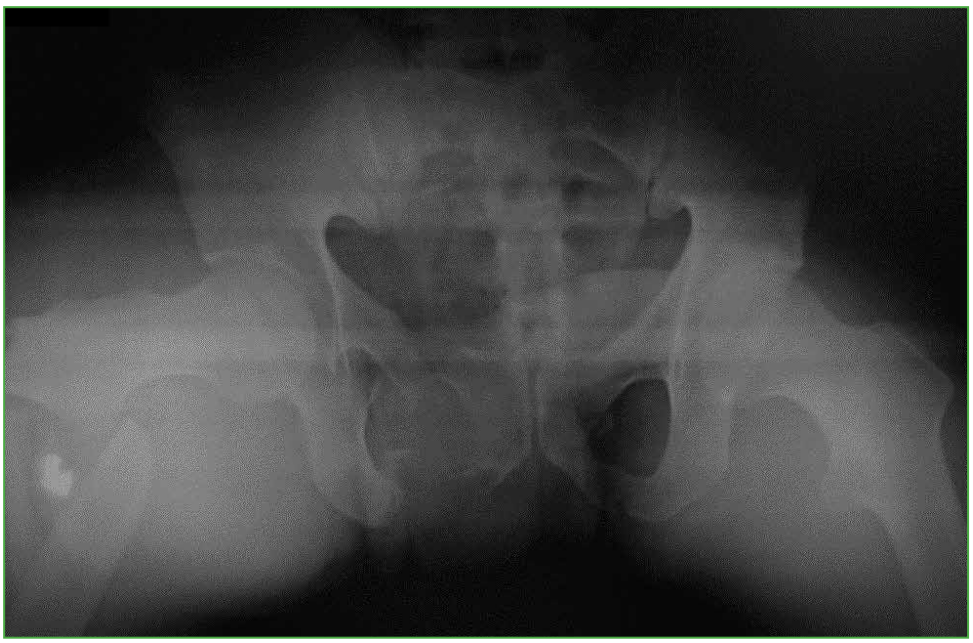

Figure 1. Anteroposterior pelvic radiograph. A pelvic fracture associated with an ipsilateral femur fracture (floating hip) is observed.

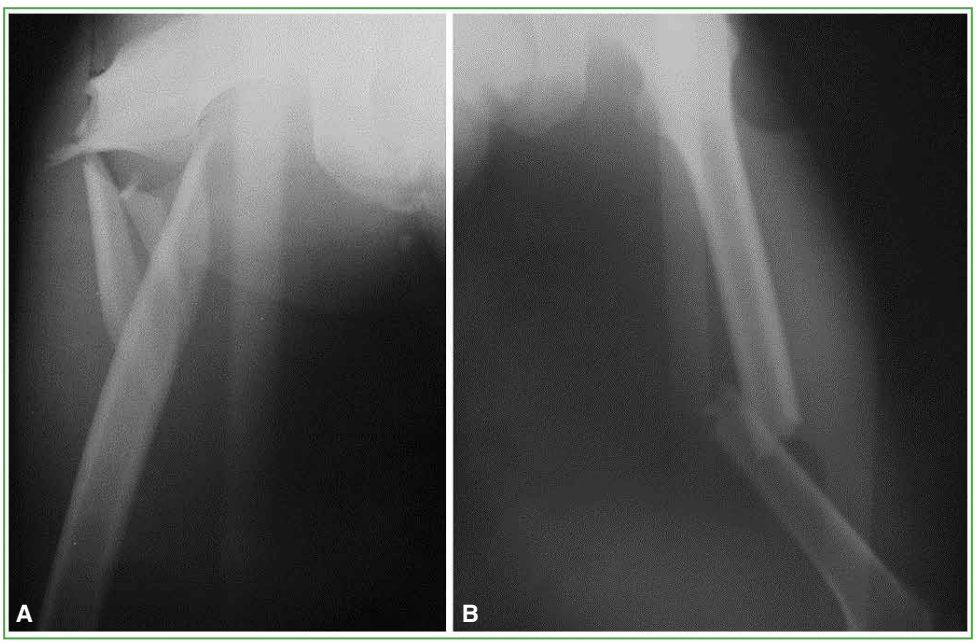

Figure 2. Anteroposterior femur radiographs with evidence of fractures (**A.** proximal, **B.** diaphyseal) in patients with floating hip.

Mechanisms of injury include high-energy accidents, and it is common for patients to sustain other associated injuries, such as fractures of other segments, soft tissue injury, traumatic brain injury, or thoracoabdominal injuries. In 1992, Liebergall classified them into three types: A, B, and C Type A floating hips (FH) are those that involve a fracture of the femur with one of the acetabulum that requires surgical treatment. Type B includes a fracture of the pelvis with another of the ipsilateral femur and type C represents a fracture of the femur together with one of the pelvis and ipsilateral acetabulum.[2] In 2002, in a series of 20 patients, Liebergall et al. explained that the mechanisms that generate these injuries are, for the most part, lateral compression, causing a fracture of the proximal femur and acetabulum, or are eventually related to the impact of the knee with the dashboard in motor vehicle accidents, with the consequent acetabular fracture-dislocation and femoral shaft fracture.[3]

The treatment of this group of patients takes place in a polytrauma setting and requires a multidisciplinary team. It poses multiple difficulties, from the initial resuscitation to the definitive resolution of the associated injuries. Various publications evidenced the need for more complex centers due to the therapeutic resources needed to treat this condition.[4,5] Although there is no management protocol for patients with FH, it is agreed that initial external stabilization is effective for resuscitation in patients who require it, since it reduces bleeding and respiratory complications, and facilitates nursing care.[6,7] Likewise, the sooner definitive osteosynthesis is performed and the patient can be mobilized, the better the functional outcomes.[8,9]

The main objective of this study was to describe the hospitalization, surgery, and rehabilitation times of a series of patients with FH. The secondary objective was to compare the outcomes obtained based on return to work with those of patients who suffered fractures of the pelvis or acetabulum without an associated femoral fracture.

MATERIALS AND METHODS

A descriptive, retrospective and multicenter study of patients with pelvic and acetabular trauma was carried out during the period between January 2014 and March 2019.

The inclusion criteria were: actively working patients, aged 18 to 65, who, at the time of admission, had a pelvic ring fracture or acetabular fracture, with a minimum follow-up of one year, between January 2014 and March 2019.

Patients with ipsilateral tibial fractures were excluded, as well as those who were initially treated at another hospital for a subsequent referral to our institution.

Patients were divided into two groups for comparison based on the presence of an associated ipsilateral femur fracture, i.e., FH patients: a) group 1 (FH); b) group 2: isolated fractures of the pelvis/acetabulum.

The data obtained from the archive of medical records and images were recorded on the following study variables: age, sex, Judet classification for acetabular fractures,[10] Tile classification for pelvic fractures,[11] and AO classification for femur fractures, number and topography of associated injuries, total surgical time, blood loss in trauma surgical procedures, temporary incapacity for work, hospitalization time in days, number of trauma surgical procedures per patient (skeletal and soft tissue), and need for job retraining.

All were evaluated following the ATLS (Advanced Trauma Life Support) protocol for the primary review of polytraumatized patients (ABCDE). When the case required it, hemodynamic stabilization and orthopedic damage control were performed[12] according to clinical parameters, initial analysis results, Injury Severity Score, and type of injury (unstable pelvic fractures with hemodynamic compromise).

Statistical analysis

Categorical variables were expressed as numbers and percentages, and were analyzed using the chi-square method or Fisher's test. The interval variables were described with the mean and median, according to their distribution and measure of dispersion, standard deviation (SD), and range. For the comparison of continuous variables, Student's t and Mann-Whitney-Wilcoxon U tests were used according to the expressed distribution. A p value <0.05 was considered statistically significant. For the analysis, the SPSS Statics 25 program was used.

RESULTS

A total of 102 patients with trauma to the pelvis or acetabulum were included, divided into two groups according to the presence of FH (FH: 23 patients, pelvis/acetabulum: 79 patients). Table 1 summarizes the global description of the sample.

Table 1. Sample Description

Variables	Results
Group, n (%) Floating Hip Pelvis or acetabulum	 23 (22.5) 79 (77.5)
Age Mean (SD) Median (range)	 38 (12) 39 (27-49)
Sex, n (%) Female Male	 23 (22.5) 79 (77.5)
Job retraining Yes No Suggested	 18 (17.6) 35 (34.3) 49 (48)
Number of procedures Mean (SD) Median (range)	 3 (1) 2 (2-3)
Days of hospitalization Mean (SD) Median (range)	 13 (23) 8 (5-10)

SD = standard deviation.

Regarding the patients in group 1 (FC), 60.9% (n = 14) were men and 39.1% were women (n = 9), with a mean age of 30 years (SD = 10). The mechanism of injury was motorcycle-car collision (78.2%, n = 18), car-car collision (13%, n = 3), and fall from own height (8.8%, n = 2). 60.8% of the patients (n = 14) had a Liebergall type A classification; 30.45% (n = 7), type B; and 8.7% (n = 2) type C. The mean follow-up time was 4.6 years (range 1.2-5).

After primary review and initial resuscitation according to the ATLS protocol with temporary stabilization of the fracture using external supports in patients, osteosynthesis was scheduled (Figures 3-5).

The femur fracture had been treated with intramedullary nails in 95.7% (n = 22) (Figure 6) and with plate and screws only in 4.3% (n = 1). The median number of hospitalization days for this population was 8 (range 5-10). The median duration of the procedures was 247 min (range 120-480) and the median estimated blood loss during the operation was 500 ml (range 300-900).

The median number of trauma procedures performed per patient was 5 (range 4-5). The median time until complete resolution of FH was 12 days (range 2-54), mainly delayed by the clinical-hemodynamic status of the patient. At the time of discharge, 17 (73.9%) patients had no pain and two (8.8%) had an injury to the external popliteal sciatic nerve, which remitted completely in both cases, six and eight months after surgery. 56.5% (n = 13) suffered associated injuries (Table 2).

In relation to group 2 (n = 79), 82.3% (n = 65) were men and 17.7% (n = 14), women. The average age was 41 years (SD 12). In this population, 77.2% (n = 61) had pelvic fractures: 25 Tile A, 28 Tile B, and 8 Tile C. The rest (22.8%, n = 18) had acetabular fractures, which, classified according to Judet, included: 4 type A, 3 type B, 5 type C, and 6 type D.

Figure 3. Patient with floating hip on the operating table before proceeding to damage control.

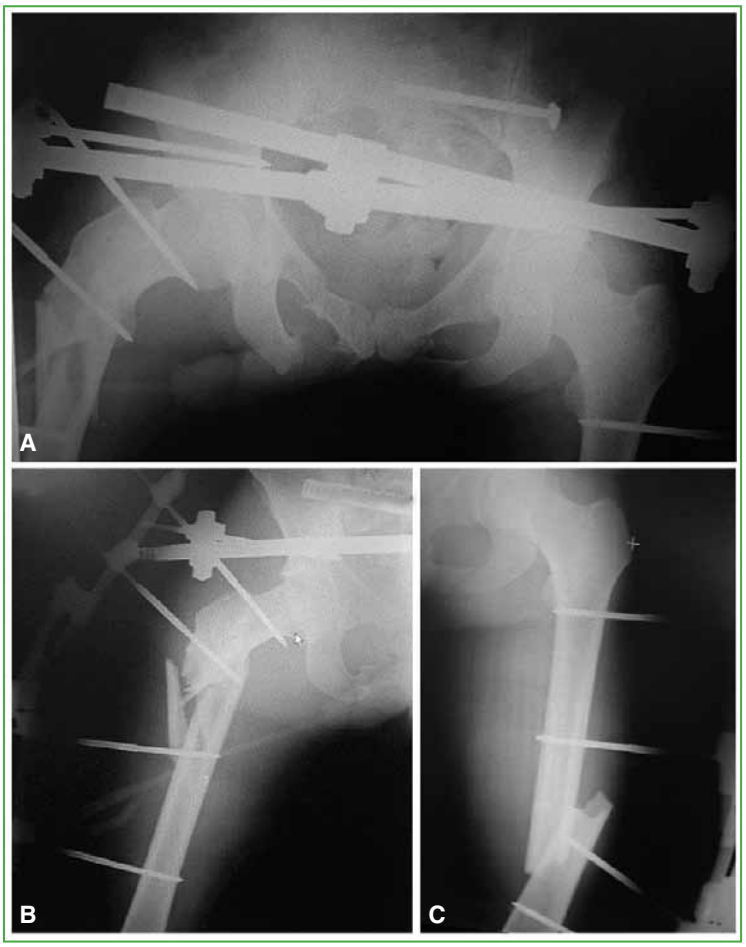

Figure 4. Anteroposterior radiographs of the pelvis and both femurs after damage control surgery. **A.** Placement of external tutors and posterior pelvic fixation. **B and C.** External fixation of femur.

Figure 5. Patient with floating hip after stabilization with external fixators.

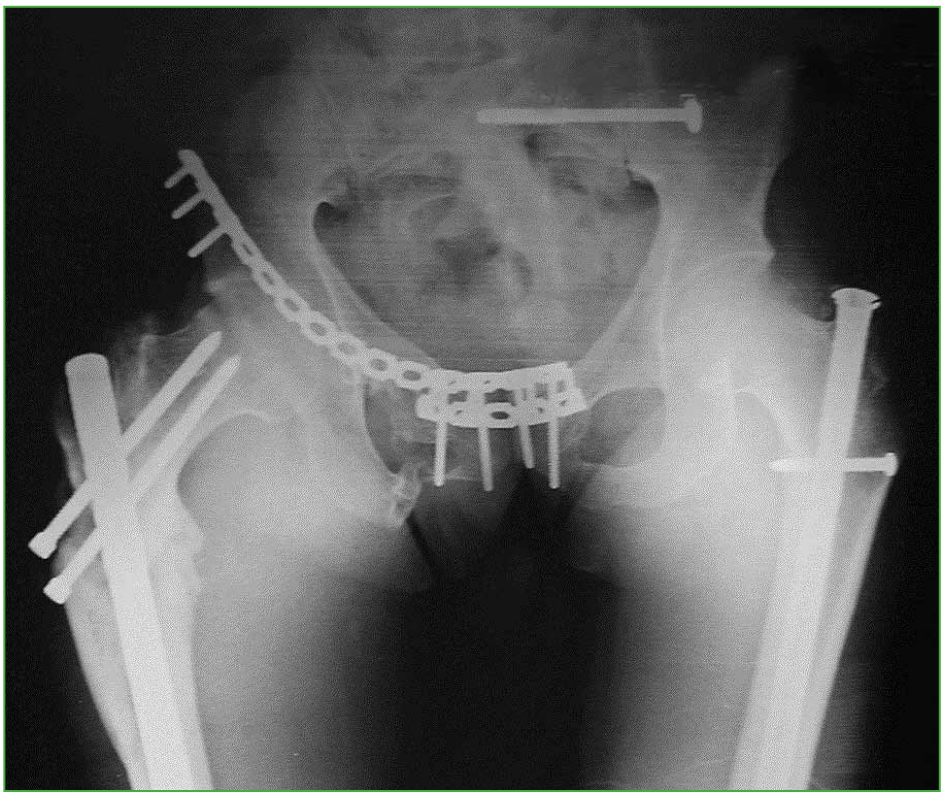

Figure 6. Pelvic radiograph including proximal femur. Postoperative control of a patient with floating hip and osteosynthesis of the pelvis and bilateral femur.

Table 2. Characteristics of the floating hip group.

Patient	Age	Sex	Pelvis (Tile) or acetabulum (Judet)	Femur (AO)	Associated injuries
1	25	F	A1	C.	TiF + MI
2	47	M	Judet A	33 A3	TMD + TiF
3	23	F	B1	32 A3	OF
4	22	F	A2/ D Judet	32 A3	PTX + STI + LSF
5	49	M	A1	C.	TPF + AF + PTX
6	25	M	E Judet	33 C3	BCP + PTX + UGI
7	28	F	A1	31 C	No
8	40	M	Judet A	33 B1	No
9	21	M	C3	32 A2	SFAL + AF + RF + mild TBI + EPSNP
10	24	M	B1	32 B3	No
11	37	F	B2	31 B	No
12	40	M	B2	31A3	No
13	19	M	B2	33C3	RF
14	23	M	A2/ D Judet	31A3	No
15	22	M	C1	32A3	HF + moderate TBI + OF + FF
16	26	M	F Judet	31A2	No
17	27	M	C3/ J Judet	32A3	TiF
18	19	M	B1	32B2	PTX
19	31	F	C3	32A3/33C1	BPC + OF + TiF + LSF + SFAL
20	35	F	G Judet	33C2	TPF + EPSNP
21	32	F	B2	32A2/32A2	HF
22	49	M	D Judet	33 A3	No
23	42	M	D Judet	31 A3	No

BPC = bilateral pulmonary contusion, FF = forearm fracture, RF = rib fracture, LSP = lumbar spine fracture, HF = humerus fracture, OF = olecranon fracture, TiF = tibial fracture, TPF = tibial plateau fracture, RF = radius fracture, AF = ankle fracture, SFAL = superficial femoral artery laceration, MI = meniscal injury, STI = soft tissue injury, TMD = tarsometatarsal dislocation, UGI = urogenital injury, PTX = pneumothorax, EPSNP = external popliteal sciatic nerve palsy, TBI = traumatic brain injury.

The surgical treatment of acetabular fractures included open reduction and internal fixation (n = 18) through a Kocher-Langenbeck approach in 50% (n = 9) of cases, an ilioinguinal window approach in 11.1% (n = 2), and, in 38.9% (n = 8), the reduction and osteosynthesis of the fracture were done percutaneously. Patients with pelvic fractures were operated on according to the fracture pattern. 24% percent (n = 6) of patients with Tile A fractures were treated percutaneously. All patients with Tile B fractures were treated with open reduction and internal fixation through a Pfannenstiel approach and the placement of one or two sacroiliac screws according to the Routt-Matta technique.[13] In 25% (n = 2) of those with Tile C fractures, reduction and anterior and posterior osteosynthesis were required, and the other cases were resolved with reduction and anterior osteosynthesis through a Pfannenstiel approach and the placement of percutaneous sacroiliac screws according to the Routh-Matta technique.

Median follow-up time was 4.5 years (range 1.2-5); hospitalization days, 7 (range 5-9); and duration of orthopedic procedures, 132 min (range 90-252). Regarding the number of orthopedic procedures per patient, the median was 2 (range 2-3). A median blood loss of 320 ml (range 250-700) was confirmed.

Comparison of the groups

When both groups were compared, significant differences were found according to age ($p < 0.0002$) (Figure 7). Due to this difference, the sample was paired by age and sex characteristics, so that the groups could be comparable.

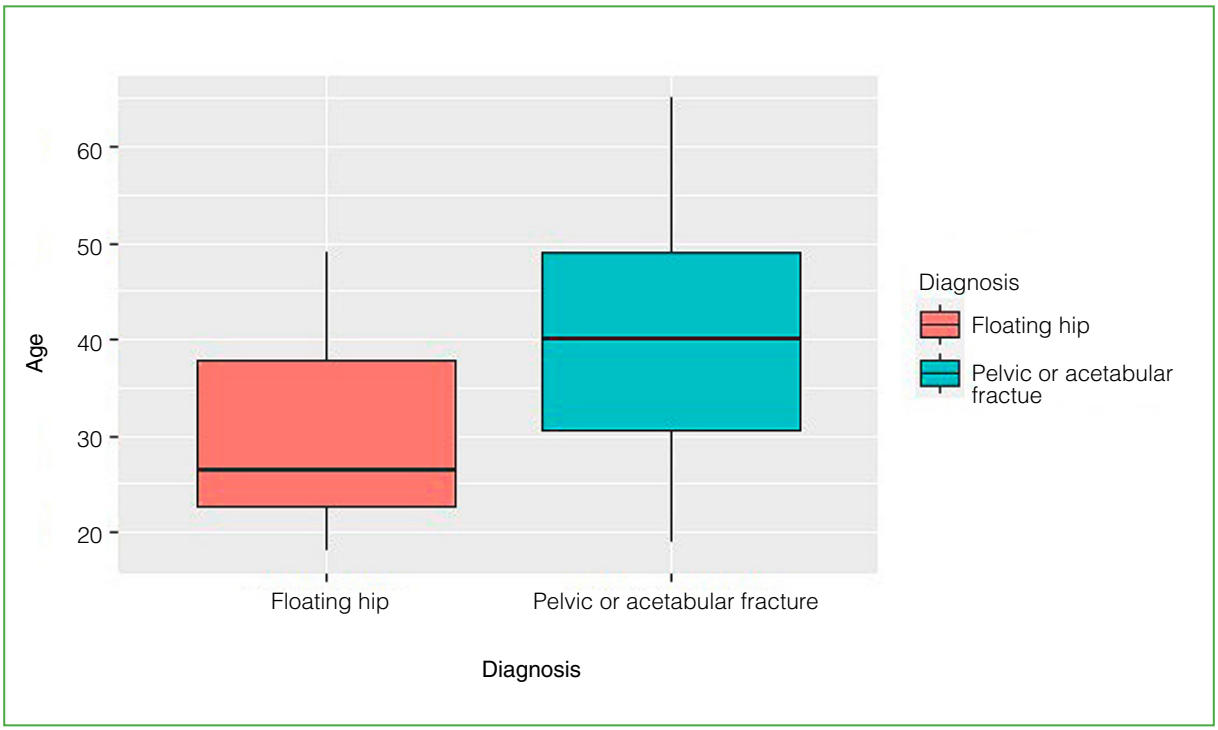

Figure 7. Box plot, age distribution according to floating hip versus pelvis/acetabulum diagnosis. The significant difference in the median age of both populations is observed.

Thus, only a subgroup of 86 patients was included in the comparison, of which 23 were from the FH group and 63 from the pelvis/acetabulum group, with no statistically significant differences between the age ($p = 0.054$) and gender ($p = 0.15$) (Figure 8).

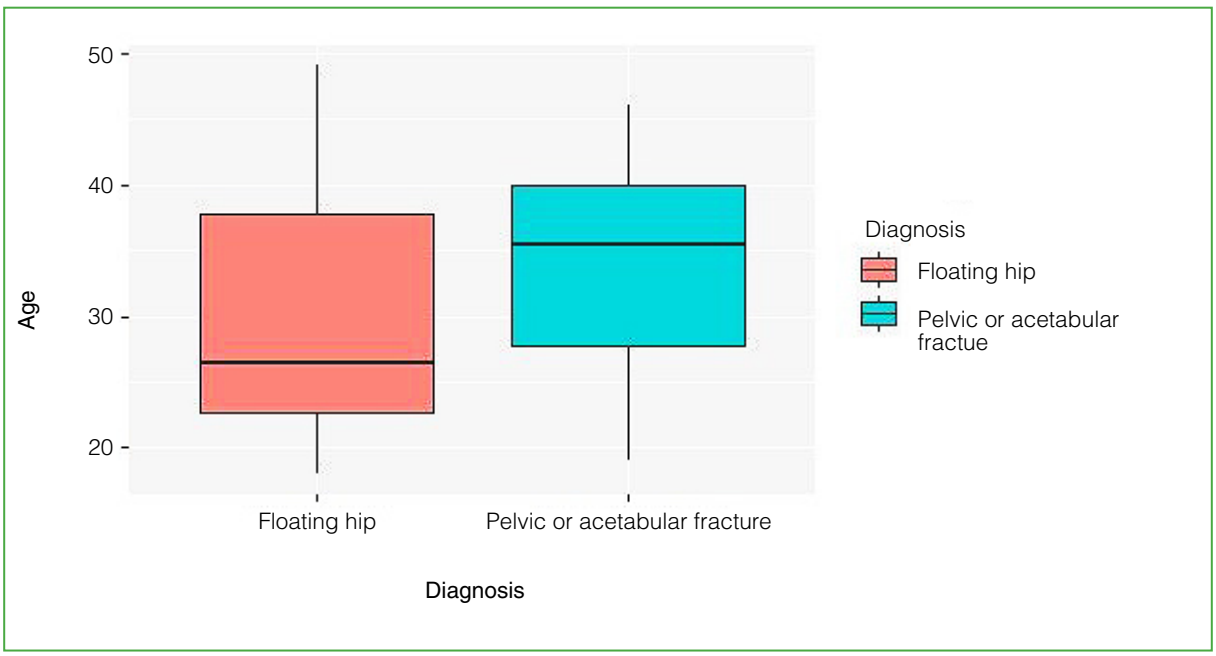

Figure 8. Box plot, distribution of age by floating hip versus pelvis/acetabulum diagnosis after age-sex pairing. No significant differences in the median age of both populations.

In this subgroup of the sample, the median number of surgical procedures per patient was 3 (range 1-8), with a mean of 2.99 (SD 1.5). The median number of hospitalization days was 8 (range 3-193), with a mean of 15.12 days (SD 26.9).

When analyzing these variables in the comparison between patients with FH versus those with fracture of the pelvis/acetabulum, the median days of hospitalization [FH 15.5 (range 4-193); pelvis/acetabulum 7 (range 3-31); p = 0.0001] and the number of surgeries per patient [FH 5 (range 3-8); pelvis/acetabulum 2 (range 1-4); p = 0.0001] were higher in patients with FH, with a statistically significant difference in the distribution of both variables (Figure 9).

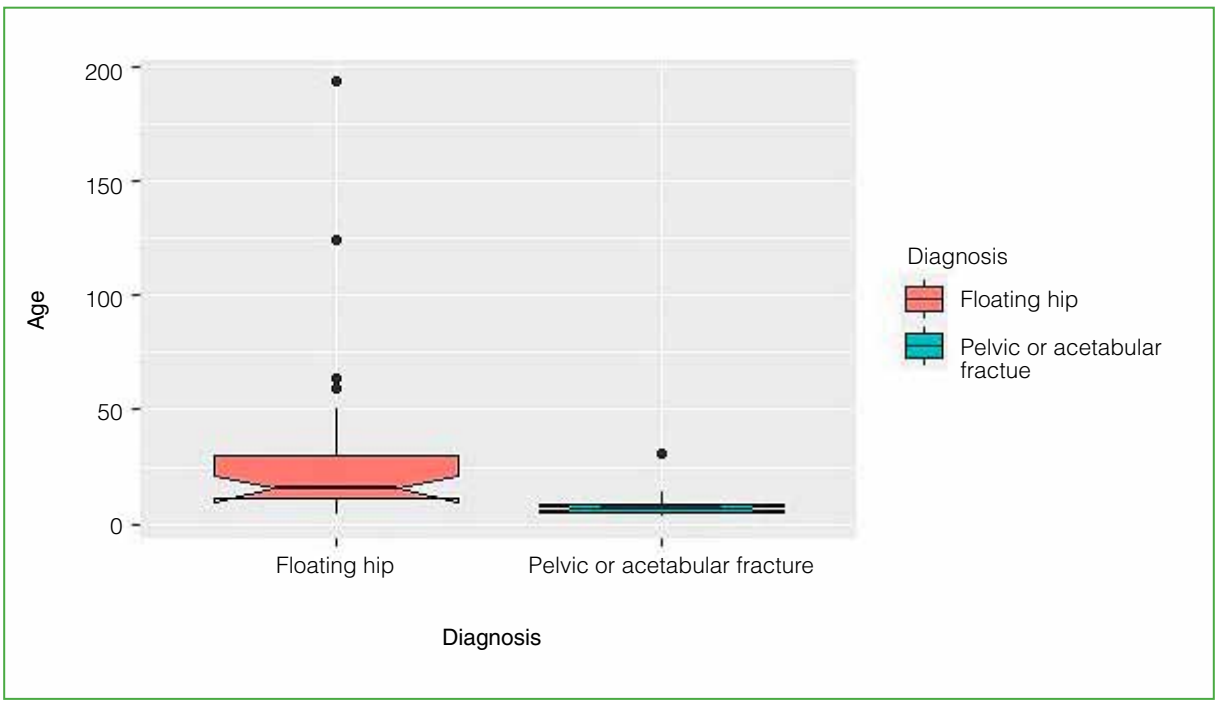

Figure 9. Box plot, distribution of days of hospitalization according to diagnosis. A statistically significant difference is observed with a higher median of hospital days in patients with floating hip.

The differences between the groups regarding temporary incapacity for work were statistically significant (p = 0.00012). There were no statistically significant differences in the job retraining rate between the groups based on the FH diagnosis (p = 0.11) (Figures 10 and 11).

DISCUSSION

Pelvic and acetabular fractures require a meticulous evaluation and skillful reconstruction to achieve the best possible outcome. The association of a femoral shaft fracture is a devastating injury that has a great impact on the quality of life of the patient. In the 1990s, Liebergall et al.[2] described this type of injury in a series of 17 patients, and Müller et al.[14] also presented 40 patients. In our study, the initial treatment of these patients was hemodynamic stabilization with external fixators, both in the femur and in the pelvis, if required. More than one surgical procedure was necessary to resolve this type of injury and the femur fracture was always the first to be treated. Liebergall et al. had a similar experience with femoral fixation as an initial procedure over fixation of pelvic or acetabular fractures, while Müller et al. fixated the femur first in only 38% of their patients.[2,14] Liebergall et al. reported several interesting correlations regarding the mechanism of injury and the type of acetabular and femoral fractures. Their data showed that car dashboard trauma was associated with proximal femoral injuries and posterior acetabular fractures, while lateral impact was associated with femoral shaft and central acetabular injuries, which would be consistent with the kinematics of transmitted energy.[2] In addition, they observed that midshaft injuries and proximal femoral fractures correlated with posterior and central acetabular fractures.[2]

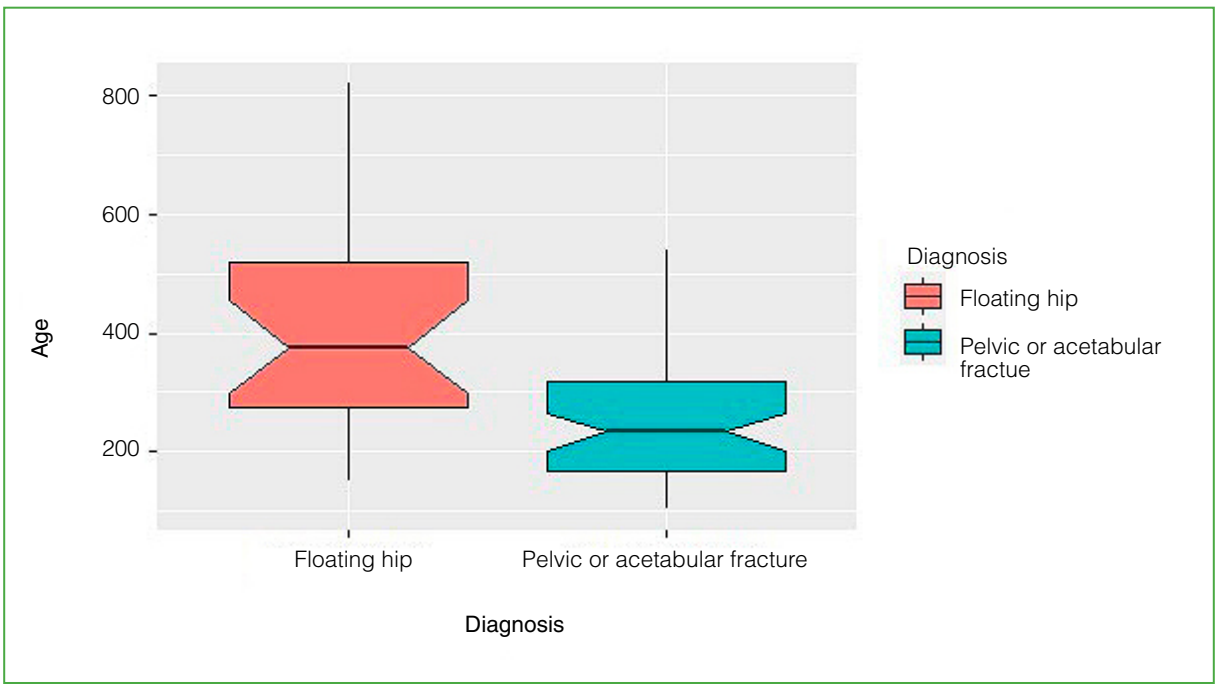

Figure 10. Box plot, distribution of days of temporary incapacity for work by group. Note that the differences were statistically significant.

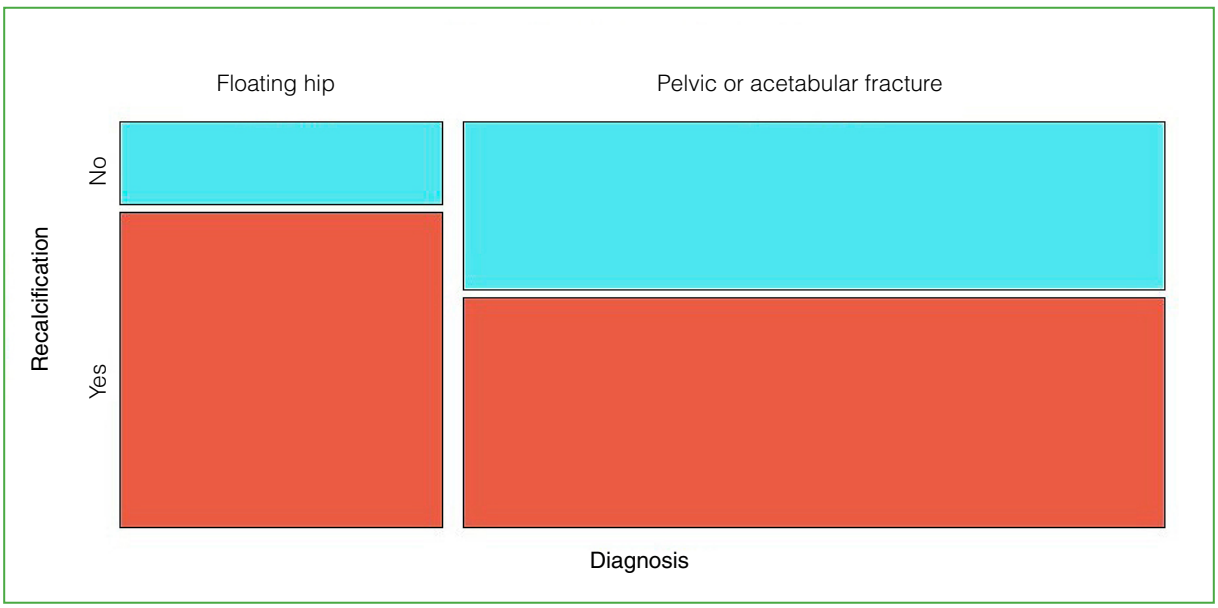

Figure 11. Stacked bar chart, distribution of job retraining rate according to diagnosis.

Achieving the reduction and stabilization of the femur fracture as the first surgical stage allowed us to carry out a better preparation of the patient and achieve a better position on the operating table at the time of observing, reducing, and stabilizing the fracture of the pelvis or acetabulum According to the literature, the orthopedic surgeon must examine the pathophysiology of the trauma and evaluate the complexity of the injuries of each traumatized patient, considering the urgent need to wait for the definitive surgery to avoid the second inflammatory impact that surgery can produce.[14,15]

The results in patients with FH must be evaluated from several points of view, including the functional, physical, emotional and economic aspects.[16,17] In the FH group, the rate of complications was higher. As previously published, it is worth highlighting the sciatic nerve injuries in two patients.[18,19]

Statistically significant differences were found regarding the length of hospitalization in both groups, which would lead us to think of an eventual possible relationship with the femoral injury when analyzing this variable. Also, non-orthopedic associated injuries that prolong hospital stay should be considered and were not analyzed in the study. We must emphasize that no published articles analyzing this item were found.

When evaluating the number of procedures performed in both groups, a statistically significant difference was found, which was greater in patients with FH. We believe that it is related to the association of other soft tissue and non-orthopedic injuries that could delay skeletal stabilization. Also, this population required more days of hospitalization.

Regarding temporary incapacity for work, the seriousness of FH was statistically demonstrated in terms of the time it took for patients with pelvic and acetabulum trauma to achieve labor reinsertion.

When analyzing the job retraining rate, no statistically significant differences were found. The job retraining rate may be related to each patient's work activity and associated non-orthopedic injuries that were not evaluated in this study. We also did not find any literature concerning this item.

Finally, regarding the blood loss recorded in the FH group during surgery, although its estimation was not the primary objective of our study, it is worth noting the lower blood loss than that reported in the original study by Liebergall et al. in 1992.[2] We believe that this could be due to better resuscitation techniques, the use of systematized protocols in orthopedic damage control surgery, the use of tranexamic acid in trauma surgeries, and the development of percutaneous techniques.

As for the weaknesses and limitations of our study, we can mention that it is a descriptive, retrospective study based on the analysis of medical records and images; thus, the patients could not be evaluated with any satisfaction scale, leading to an eventual bias. However, we consider that it is a significant contribution, because it provides information on an association of high-morbidity injuries, with few international publications and without precedents published in our country and the regio

CONCLUSION

In our series, patients with FH required more surgical procedures and days of hospitalization, and temporary incapacity for work was greater, with the consequent increase in days of rehabilitation, compared to isolated fractures of the pelvis or acetabulum. No differences were found in the job retraining rate.

Conflict of interest: The authors declare no conflicts of interest.

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REFERENCES

1. Blake R, McBryde A Jr. The floating knee: Ipsilateral fractures of the tibia and femur. *South Med J* 1975;68(1):13-6. PMID: 807974
2. Liebergall M, Lowe J, Whitelaw GP, Wetzler MJ, Segal D. The floating hip. Ipsilateral pelvic and femoral fractures. *J Bone Joint Surg Br* 1992;74(1):93-100. https:://doi.org/10.1302/0301-620X.74B1.1732275
3. Liebergall M, Mosheiff R, Safran O, Peyser A, Segal D. The floating hip injury: patterns of injury. *Injury* 2002;33(8):717-22. https://doi.org/10.1016/s0020-1383(01)00204-2
4. Zamora-Navas P, Guerado E. Vascular complications in floating hip. *Hip Int* 2010;20(Suppl 7):S11-8. https://doi.org/10.5301/HIP.2010.4300
5. Tiedeken NC, Saldanha V, Handal J, Raphael J. The irreducible floating hip: a unique presentation of a rare injury. *J Surg Case Rep* 2013;2013(10):rjt075. https://doi.org/10.1093/jscr/rjt075
6. Tornetta P 3rd, Dickson K, Matta JM. Outcome of rotationally unstable pelvic ring injuries treated operatively. *Clin Orthop Relat Res* 1996;(329):147-51. https://doi.org/10.1097/00003086-199608000-00018
7. Johnson KD, Cadambi A, Seibert GB. Incidence of adult respiratory distress syndrome in patients with multiple musculoskeletal injuries: effect of early operative stabilization of fractures. *J Trauma* 1985;25(5):375-84. https://doi.org/10.1097/00005373-198505000-00001
8. Matta JM. Fractures of the acetabulum: accuracy of reduction and clinical results in patients managed operatively within three weeks after the injury. *J Bone Joint Surg Am* 1996;78(11):1632-45. PMID: 8934477
9. Baumgaertner MR. Fractures of the posterior wall of the acetabulum. *J Am Acad Orthop Surg* 1999;7(1):54-65. https://doi.org/10.5435/00124635-199901000-00006
10. Judet R, Judet J, Letournel E. Fractures of the acetabulum: classification and surgical approaches for open reduction. Preliminary report. *J Bone Joint Surg Am* 1964;46:1615-46. PMID: 14239854
11. Tile M. Pelvic ring fractures: should they be fixed? *J Bone Joint Surg Br* 1988;70(1):1-12. https://doi.org/10.1302/0301-620X.70B1.3276697
12. Giannoudis P, Jones AL, Malkani AL, PapeHC, Rodriguez J. Damage control orthopaedics: New approaches in orthopaedic traumatology to the isolated extremity injury and polytrauma. Chicago, IL: Instructional Course in Trauma Number: 374. AAOS 73th Annual meeting; 2006 March 22-25. Chicago, Illinios, USA: American Academy Orthopaedic Surgeons.
13. Routt ML Jr, Simonian PT. Closed reduction and percutaneous skeletal fixation of sacral fractures. *Clin Orthop Relat Res* 1996;(329):121-8. https://doi.org/10.1097/00003086-199608000-00015
14. Müller EJ, Siebenrock K, Ekkernkamp A, Ganz R, Muhr G. Ipsilateral fractures of the pelvis and the femur--floating hip? A retrospective analysis of 42 cases. *Arch Orthop Trauma Surg* 1999;119(3-4):179-82. https//doi.org/10.1007/s004020050385
15. Ogura H, Tanaka H, Koh T, Hashiguchi N, Kuwagata Y, Hosotsubo H, et al. Priming, second-hit priming, and apoptosis in leukocytes from trauma patients. *J Trauma* 1999;46(5):774-81; discussion 781-3. https://doi.org/10.1097/00005373-199905000-00004
16. Christensen MC, Banner C, Lefering R, Vallejo-Torres L, Morris S. Quality of life after severe trauma: results from the global trauma trial with recombinant Factor VII. *J Trauma* 2011;70(6):1524-31. https://doi.org/10.1097/TA.0b013e3181f053c2
17. Zamora-Navas P, Estades-Rubio FJ, Cano JR, Guerado E. Floating hip and associated injuries. *Injury* 2017;48(Suppl 6):S75-S80. https://doi.org/10.1016/S0020-1383(17)30798-2
18. Burd TA, Hughes MS, Anglen JO. The floating hip: complications and outcomes. *J Trauma* 2008;64(2):442-8. https://doi.org/10.1097/TA.0b013e31815eba69
19. Iotov A, Tzachev N, Enchev D, Baltov A. Operative treatment of the floating hip. *Orthopaedic Proceedings* 2018;88(Suppl 1):160. Available at: https://online.boneandjoint.org.uk/doi/abs/10.1302/0301-620X.88BSUPP_I.0880160c