



CASE REPORT

[Translated article] Study of hemodynamic instability due to intrapelvic hemorrhage as a consequence of ilioischiopubic branch fractures in geriatric patients

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KEYWORDS

Hemodynamic instability;
Supraselective embolisation;
Pelvic ramus fracture;
Geriatric patients

Abstract

Introduction: Pelvic branch fractures are a common feature in old people which are usually treated conservatively. Massive hemorrhage is a strange complication that can compromise the patient's life.

The objective of this study is to determine the incidence and possible risk factors of massive arterial injury in fractures of pelvic branches due to low energy trauma in patients over 65 years old.

Clinical case: Observational study of 142 patients diagnosed with pelvic branch fracture, We analysed the age, sex, anatomical location, hemoglobin, need for hospital admission, complementary diagnostic test, complications and hospital stay.

Results: All those ilioischiopubic fractures complicated with massive bleeding (4 patients) were located in the Nakatami area I in close relationship with the obturator artery, internal pudendal artery and the Corona Mortis. All patients needed supraselective embolisation for hemorrhagic control. Three of the patients were taking anticoagulants.

Discussion: 2.8% of patients with pelvic branch fractures may suffer a hemorrhagic complication. Be able to establish possible risk factors such a medication or anatomical location can help us identify these patients and carry out closer surveillance.

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PALABRAS CLAVE

Inestabilidad hemodinámica;
Embolización supraselectiva;
Fractura ramas pélvicas;
Pacientes geriátricos

Estudio de la inestabilidad hemodinámica por hemorragia intrapélvica como consecuencia de fracturas de ramas ilioisquiopúbicas en pacientes geriátricos

Resumen

Introducción: Las fracturas de ramas pélvicas son una entidad frecuente en ancianos que habitualmente se trata de manera conservadora. La hemorragia intrapélvica es una complicación poco frecuente que puede llegar a comprometer la vida del paciente.

El objetivo del estudio es determinar la incidencia y posibles factores de riesgo de sangrado masivo en fracturas de ramas pélvicas por traumatismos de baja energía en pacientes mayores de 65 años.

Caso clínico: Estudio observacional de 142 pacientes mayores de 65 años diagnosticados de fractura de ramas pélvicas. Analizamos edad, sexo, localización anatómica según Nakatani, hemoglobina al ingreso, necesidad de ingreso hospitalario, pruebas complementarias, complicaciones y estancia hospitalaria media.

Resultados: Todas aquellas fracturas de ramas ilioisquiopúbicas complicadas con sangrado (4 pacientes) se encontraban en el área I de Nakatani, en íntima relación con la arteria obturatriz, arteria pudenda interna y la temida Corona Mortis. Todos los pacientes fueron sometidos a embolización supraselectiva para control hemorrágico.

Discusión: Un 2,8% de los pacientes con fracturas de ramas pélvicas pueden sufrir una complicación hemorrágica que comprometa su vida. Establecer posibles factores de riesgo como la toma de medicación antiagregante/anticoagulante o la localización anatómica puede ayudarnos a identificar a estos pacientes y llevar a cabo una vigilancia más estrecha.

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Introduction

Pelvic branch fractures are a frequent entity in our environment, affecting mainly elderly patients by low-energy mechanisms. Its frequency increases to 334 cases per 100,000 inhabitants in patients over 85 years of age.¹

Its diagnosis is fundamentally clinical, characterised by impotence for ambulation and localised pain in the groin which worsens with active hip mobility.

The most well-known classification for pelvic fractures is the Tile classification, with branch fractures belonging to type A1 (without pelvic ring involvement) and A2 (with pelvic ring involvement without displacement). A more specific classification of ilio-ischiopubic branch fractures is based on the Nakatani² scheme, with type I being medial to the obturator foramen, type III lateral to the obturator foramen and type II in between both.

The most common management of limb fractures is conservative, based on symptomatic treatment of pain and relative rest.

The most serious complication is haemodynamic instability, although this is a very rare complication.³ The vascularisation of the pelvis depends mainly on 2 arteries: the hypogastric artery and the external iliac artery. The hypogastric artery divides at the upper edge of the sciatic foramen into two trunks, the posterior trunk and the anterior trunk, from which the obturator artery and the internal pudendal artery arise, leaving the pelvis through the greater sciatic notch and re-entering the perineum through the lesser sciatic notch. From the external iliac artery we highlight the epigastric artery due to its relationship with the Corona Mortis⁴ or also known as the artery of death, a

venous, arterial or mixed anastomosis of branches of the epigastric vessels with the obturator vessels present in 10%–15% of the population.

In cases in which haemodynamic instability occurs, it is necessary to perform an angio-CT or arteriografía⁵ to identify the vessel responsible for the bleeding, and to be able to carry out a supraselective embolisation of the vessel.⁶

The aim of our study is to determine the incidence and possible factors of massive bleeding in iliac and ischiopubic branch fractures due to low-energy trauma in patients over 65 years of age

Clinical case

We conducted a retrospective observational study of 142 patients diagnosed with ilio-ischiopubic branch fractures between 2012 and 2018 in our hospital.

The inclusion criteria in our study were:

- Acute (less than 24 h) ischiopubic and ilium branch fractures.
- Low-energy traumas.
- Aged over 65 years.
- The exclusion criteria of our study were:
- Presence of fractures at another level.
- High-energy traumas.
- Internal injuries and/or visceral disorders.

The data analysed were:

- Age.
- Sex.



Figure 1 A) Nakatani areas. B) Fractures of branches located in Nakatani area I. C) Supraselective embolisation.

- Location according to the Nakatani classification.
- Haemoglobin on admission to the emergency services.
- Need for hospital admission.
- Complementary tests.
- Complications.
- Anti-aggregant/anticoagulant mediation.
- Hospital stay.

Results

One hundred and forty-two patients were included in our study. Eighty-four females (59.15%) and 58 males (40.85%). The mean age was 72 years.

Diagnosis was made by means of an anteroposterior radiograph of the pelvis, supplemented by CT in 3 cases due to suspicion of cup involvement. In terms of location based on the Nakatani classification, 64 of the patients (45.1%) had pelvic branch fractures in area I, 25 patients (17.6%) in area II and 53 patients (37.3%) in area III.

The mean haemoglobin of the patients at the time of ED diagnosis was 11.97 g/dL.

Of all those diagnosed with pelvic branch fracture, 53 patients (37%) required hospital admission, 47 of them (88%) because of anaemia of at least 2 points in the 6 h control haemogram and 6 patients (12%) because of social problems. No patient required hospital admission for pain control only.

Of the admitted patients, only 14 (27%) were taking antiplatelet/anticoagulants.

The mean haemoglobin of the admitted patients was 10.2 g/dL. In those patients taking antiplatelet drugs or anticoagulants it was slightly lower (9.6 g/dL).

Only 4 of the admitted patients (2.8%) suffered haemodynamic instability as a consequence of bleeding and required supraselective embolisation for stabilisation. Three were female and one male. Mean age was 75 years.

In terms of comorbidities, two of the patients had ACxFA treated with anticoagulants, one patient had dilated cardiomyopathy treated with anticoagulants and the other had no disease of interest.

On examination, the 4 patients presented with the usual symptoms of pain on palpation in the groin and on both active and passive mobility of the hip on the affected side.

All the fractures were in zone I of Nakatani.

One of the patients, 4 h into his hospital stay, began with a sudden onset of haemodynamic instability. The control haemoglobin level was 7.2 g/dL, rising only to

7.4 g/dL after transfusion of 2 red cell concentrates. An emergency CT angiography was requested, showing active bleeding through the left obturator branch.

In the other 3 patients, clinical symptoms were more progressive, with a gradual decrease in haemoglobin despite red blood cell transfusions. After 4 ineffective red blood cell transfusions, an urgent angio-CT scan was requested, showing active bleeding from the distal branch of the obturator artery, the internal pudendal artery and the root of the penile artery in the case of the male patient (Fig. 1).

In all cases, supraselective embolisation of the bleeding artery using onyx was necessary.

After embolisation, all patients progressed favourably, with a mean control haemoglobin of 12 g/dL 7 days after embolisation.

Sitting was delayed at 13 and 16 days in 2 of the patients due to dizziness on incorporation.

Ambulation was initiated after 30 days in all embolised patients.

The mean hospital stay lengthened to 29 days in patients who required embolisation compared to a mean hospital stay of 12 days in patients who did not require embolisation.

Table 1 shows the most significant differences between patients who required embolisation versus those who did not require embolisation.

Discussion

The incidence of pelvic fractures is 22 cases/per 100,000 population per year, rising to 334 cases/per 100,000 population in people over 85 years of age.¹

Treatment is conservative in most cases, based on relative rest, pain control and monitoring of haemoglobin levels in the first 48 h.

Its most serious complication is haemorrhage, which is why we must assess the concomitant disease and the patient's own treatments, as it is increasingly common to take anti-aggregants or anticoagulants. Angulo et al.,⁷ recommended in their study the need for haemodynamic monitoring for at least 6 h in patients taking anticoagulants or antiplatelet drugs.

Massive haemorrhage, although rare, can be life-threatening. For correct diagnosis and early treatment it is necessary to perform an angio-CT or arteriography when blood pressure is less than 100 mmHg or when a large pelvic

Table 1 Differences between embolised patients compared to non-embolised patients.

	Embolised patients	Non-embolised patients
Mean age	75 years	73 years
Initial Hg	7.4 g/dL	10.9 g/dL
Fracture site	Nakatani area 1: 100%	Area 1: 45.3%
		Area 2: 18%
		Area 3: 34.7%
Hospital stay	29 days	12 days
Beginning to sit	11 days	2 days
Beginning to walk	30 days	18 days

haematoma or contrast extravasation is demonstrated on CT scan.⁵

The most frequently affected vessels are the inferior gluteal artery, vesical artery, obturator, iliolumbar and sacral arteries.⁸

Supraselective embolisation of the bleeding artery is a valid procedure to stop bleeding. In previous studies reviewed,⁶ the criteria for embolisation in patients with iliac and ischiopubic branch fractures are systolic blood pressure less than 90 mmHg, fluid resuscitation of more than 2000 ml or the need for more than 4–6 red blood cell transfusions in less than 24 h. In our study, embolisation was indicated in patients with signs of haemodynamic instability (blood pressure less than 90 mmHg despite adequate blood volume replacement) or those who required more than 4 red cell concentrates and active bleeding on angio-CT.

Papakostidis et al.,⁹ concluded that supraselective embolisation is an effective method for the control of arterial bleeding in patients with pelvic trauma. However, up to 11% may present complications such as superficial or deep infections, gluteal muscle necrosis, surgical wound dehiscence or impotence.¹⁰ In our series we did not find any complications derived from embolisation.

From our study we can highlight that pelvic branch fractures are a frequent entity in elderly patients. In the majority of cases it is a benign disease that occurs without complications; however, there is a small percentage of patients who may become complicated with life-threatening active bleeding. It is in these patients that an action protocol must be established for early diagnosis and treatment.

Based on our experience, as well as published literature reviews, we recommend close monitoring of all patients with anaemia of at least 2 g/dL in the control haemogram and the performance of an angio-CT scan in haemodynamically unstable patients or with a haemoglobin level of less than 8 g/dL despite transfusion of red blood cell concentrates. We also recommend supraselective embolisation if active bleeding appears on CT angiography or arteriography.

Level of evidence

Level of evidence III.

Conflict of interest

The authors declare no conflict of interest regarding the research, authorship, and/or publication of this article.

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References

- Rodriguez Merchan EC, Alonso Carro GA, Ortega Andreu MO. *Fracturas osteoporóticas: prevención y tratamiento*. Madrid: Ed Médica Panamericana; 2003.
- Starr AJ, Nakatani T, Reinert CM, Cederberg K. Superior pubic ramus fractures fixed with percutaneous screws: what predicts fixation failure? *J Orthop Trauma*. 2008;22:81–7.
- Fernández-Lombardia J, Paz-Aparicio J, Hernández-Vaquero D. Complicación vascular tras fractura de ramas pélvicas. *Rev Esp Cir Ortop Traumatol*. 2014;58:407–10.
- Darmanis S, Lewis A, Mansoor A, Bircher M. Corona Mortis: an anatomical study with clinical implications in approaches to the pelvis and acetabulum. *Clin Anat*. 2007;20:433–9.
- Bozeman MC, Cannon RM, Trombold JM, Smith JW, Franklin GA, Miller RB. Use of computed tomography finding and contrast extravasation in predicting the need of embolization with pelvic fractures. *Am Surg*. 2012;78:825–30.
- Verbeek D, Sugrue D, Balogh Z, Cass D, Civil I, et al. Acute management of hemodynamically unstable pelvic trauma patients: time for a change? Multicenter review of recent practice. *World J Surg*. 2008;32:1874–82.
- Angulo TM, Fernandez LT, Hidalgo MB, Ungria MJ, Gros BB, Fernández LN, et al. Fractura osteoporótica de ramas pélvicas: ¿son una lesión benigna? *Rev Cubana Ortop Traumatol*. 2016;30:172–82.
- Daeubler B, Anderson S, Leunig M, Triller J. Hemorrhage secondary to pelvic fracture: coil embolization of an aberrant obturator artery. *J Endovasc Ther*. 2003;10:676–80.
- Papakostidis C, Kanakaris N, Dimitrou R, Giannoudis PV. The role of arterial embolization in controlling pelvic fracture hemorrhage: a systemic review of the literature. *Eur J Radiol*. 2012;81:897–904.
- Matityahu A, Marmor M, Elson JK, Lieber C, Rogalski G, Lin C. Acute complications of patients with fractures after pelvic angiographic embolization. *Clin Orthop Rel Res*. 2013;471:2906–11.