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Clinical framework and management of coxo femoral fractures according to italian society of orthopedics guidelines

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Summary

Proximal femoral fractures represent a serious and debilitating event, especially in the elderly population, and constitute an important public health problem. The prognosis of untreated proximal femoral fractures is often poor. Therefore, prompt surgery remains the primary choice of treatment. Patients should be surgically treated as soon as possible (within 48 hours), following the rapid stabilization of any associated pathologies in the acute imbalance phase. It is important to conform to orthopedic and multidisciplinary treatments as much as possible, in agreement with national and international guidelines. The type of surgical treatment is chosen based on classification of the fracture using precise guidelines. Any treatment must include an adequate rehabilitation plan, starting from the day after the operation in which weight load is possible. In conclusion, in order to manage a coxofemoral fracture, the following is necessary: an accurate study of the fracture, meticulous classification of the fractured patient, evaluation of the various therapeutic possibilities based on given guidelines, best practice, and consolidated principles.

Key words: femoral, fracture, guidelines, surgical, treatment

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Introduction

Proximal femoral fractures are a very serious and debilitating event, especially in the elderly population, and constitute an important public health issue. In order to be as prepared as possible for the increased burden on health care and social services [1], it is desirable to predict the future number of patients with proximal femoral fractures. Proximal femoral fractures in the elderly occur in result of accidental falls or low-energy trauma and are often associated with osteoporosis/low bone mass and other general medical conditions, such as functional insufficiency of the lower limbs, Parkinson's disease, and visual and cognitive impairment, which can increase the risk of falls [2]. The prognosis of untreated proximal femoral fractures is often poor. Patients with this type of fracture are at risk for cardiovascular, pulmonary, thromboembolic, infectious, and hemorrhagic complications, which greatly

increase the risk of death [3,4]. Therefore, prompt surgery remains the primary choice of treatment.
However, functional decline and reduced quality of life are also common after surgery. Mortality within 1 month of proximal femoral fracture surgeries approaches 10%. Patients who survive up to 30 days are at substantial risk for disability. Even among patients who have good autonomy in daily activities,ì prior to the fracture of the femur, 11% are bedridden, 16% are in a long-term care facility, and 80% use walking aids at 1 year after the fracture [5]. In addition, 76% of patients are more than 80 years old and, of these, 96% have more than one comorbidity. For these reasons, one-year mortality is considered high (around 20%).
Proximal femoral fractures account for 30% of trauma surgeries in Orthopedics Units. Early fixation failure (within 3 months) occurs in 12% to 24% of surgically-treated patients. Major risk factors include advanced age, inaccurate reduction, and posterior comminution of the femoral neck.
Patients should be surgically treated as soon as possible (within 48 hours) after the rapid stabilization of any associated pathologies in the acute imbalance phase. Delays in surgery lead to a significant increase in hospital stay, morbidity (pressure ulcers, pneumonia, thromboembolic complications), and mortality and are not justified if linked to unrealistic goals of clinical stabilization of the patient (e.g. slight electrolyte alterations) or non-modifiable risk factors, such as age [6].
It is important to standardize not only orthopedic but also multidisciplinary treatments as much as possible, in accordance with national and international guidelines, such as those of the Italian Society of Orthopedics and Traumatology (SIOT).
Proximal femoral fractures are distinguished in medial (intracapsular) and lateral (extracapsular) fractures. They occur through two main injury mechanisms: rotational joint trauma of the hip which tends to cause an intracapsular fracture or direct trauma which, more frequently, leads to extracapsular fracture [7].

Medial fractures

Medial intracapsular fractures are basically divided into compound (Garden type I and type II) and displaced (Garden type III and IV).
A greater degree of displacement of the fracture is associated with an increased risk for disruption of femoral head blood supply, which is largely supplied by the lateral circumflex femoral artery and the medial circumflex femoral artery. Bleeding from an intracapsular fracture can also affect microcirculation of the femoral head, resulting in impaired blood supply, which can lead to avascular necrosis of the femoral head and nonunion of the fracture [8].
A correct diagnostic analysis through imaging is essential for proper patient management. X-ray study has a fundamental role in the first instance, possibly performed in antero-posterior and axial hip projections [2].
Often in an emergency regime and in the light of the patient's clinical status, x-rays from the Emergency Department are made in non-canonical projections (for example on a spine board), and in some cases it is not possible to perform the axial projection due to pain. In the absence of clear radiographic signs of fracture it is advisable to perform an MRI as a second level examination, especially in patients with modest entity referred trauma and in the presence of pain and positive clinical tests of the hip [2].
On the other hand, when clear signs of fracture are found in radiographic images but it is difficult to establish the pattern and classification, it is important to perform a CT with 2D and 3D reconstruction in order to give the correct indications for treatment (Fig. 1). If the patient arrives in the operating room without an adequate imaging study, it is mandatory to perform a scopey study in the two standard projections of the fracture, on the operating table with the limb in modest traction [2].
Diagnosis indicates the solution and diagnostic failure exposes the surgeon to error.
Therefore, it is important to minimize diagnostic inaccuracies, since these patients are often considered as "one shot surgery", due to numerous comorbidities and advanced age.
The type of surgical treatment is established based on the classification according to precise guidelines: internal fixation is recommended for compound fractures, while prosthetic replacement is indicated for potentially unstable fractures.
To establish the most correct type of osteosynthesis, we rely on the Pawels classification, which is based on the inclination of the fracture gap (Fig. 2).
In patients who have a compound and valgus impacted intracapsular fractures, regardless of age, it is advisable to opt for a synthesis with three screws and possibility of weight load immediately after surgery.
For compound fractures with a rhyme above 45°, the patient's age, clinical condition, and bone quality are important variables in establishing the type of treatment.
In patients in generally good condition and with good bone quality, a synthesis with DHS plate and anti-rotational screw (Dynamic Hip Screw) will be opted for, with the weight load possibility in the immediate post-operative period.
In patients with an advanced age and/or with poor bone quality, a partial or total prosthetic solution is preferred, based on functional requirements, cognition, and walking abilities.
In displaced intracapsular fractures, in patients under 65 years of age, a reduction and synthesis intervention with DHS plate and anti-rotational screw is preferred, while adequately informing the patient through specific consent forms about the possibility of failure of this type of osteosynthesis.
In older patients, prosthetic replacement (partial or total based on the considerations described above) is the gold standard for this type of fracture.

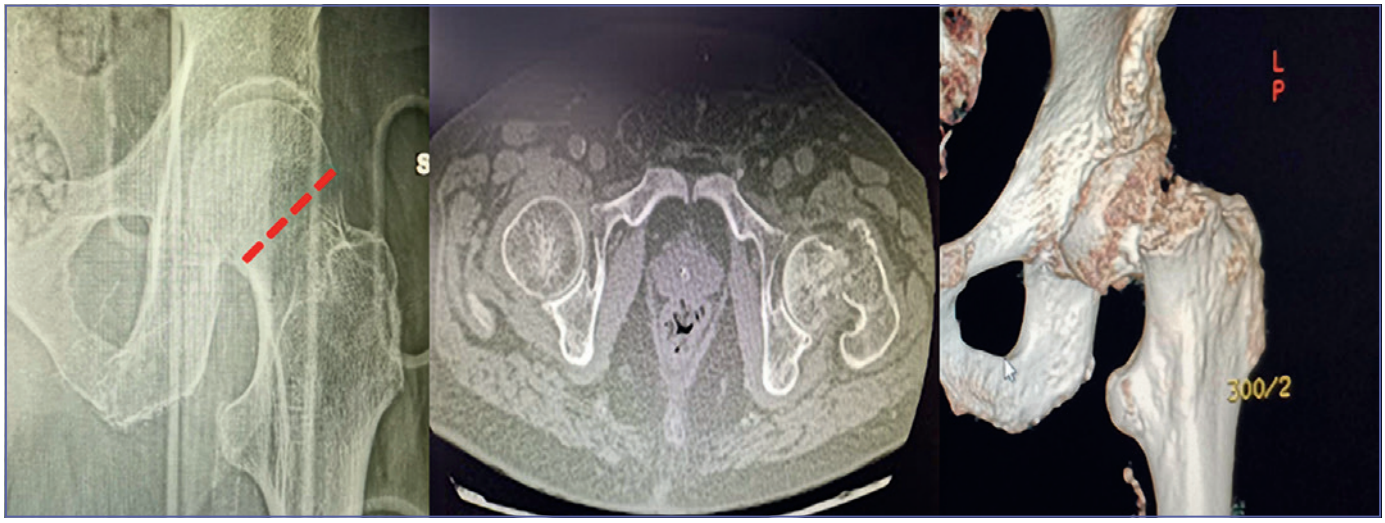

Figure 1. When it's difficult to establish the pattern and the classification, it's important to perform a CT with 2D and 3D reconstruction, in order to give the correct indication of treatment.

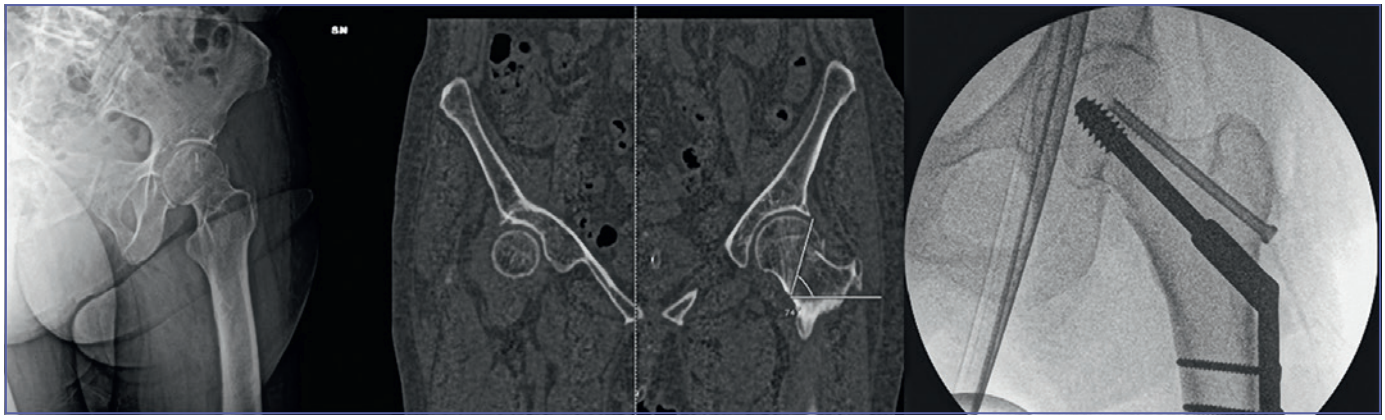

Figure 2. To establish the most correct type of osteosynthesis we rely on the Pawels classification, based on the inclination of the fracture gap.

In the most difficult patients with cognitive problems, over the last 5 years at our Orthopedics Unit we have used the direct anterior route as surgical access for implantation of the head prosthesis (Fig. 3).

Lateral fractures

In lateral extracapsular fractures of the proximal femur, considered stable in the AO-OTA classification (A1 or A2.1), it is recommended to perform a synthesis with DHS plate or cephalomedullary nail after adequate reduction. As indicated by guidelines, there is the possibility of immediate weight load and early mobilization with the help of a physiotherapist.
In fractures considered unstable in the AO-OTA classification (A2.2, A2.3 and A3), blocked cephalomedullary nails seem to be better indicated; alternatively, DCS plates and conformed plates (Compression plating) can be indicated following the rules of traumatology and protecting the soft tissues.
In selected cases, cerclage wiring can be used, positioned with a minimally invasive technique instruments protecting the soft tissues, avoiding detachments since they are often at the basis of delays in consolidation (Fig. 4).
A diagnosis of stable or unstable fracture becomes decisive and, often it is not always possible only through the emergency room x-rays alone (Insert the series of images of the PS); in this case, the choice of CT with two- and three-dimensional reconstruction allows a more complete diagnostic framework, allowing the surgeon to choose the most suitable synthesis for the particular fracture pattern.
Sometimes, in order to ensure immediate weight load, in el-

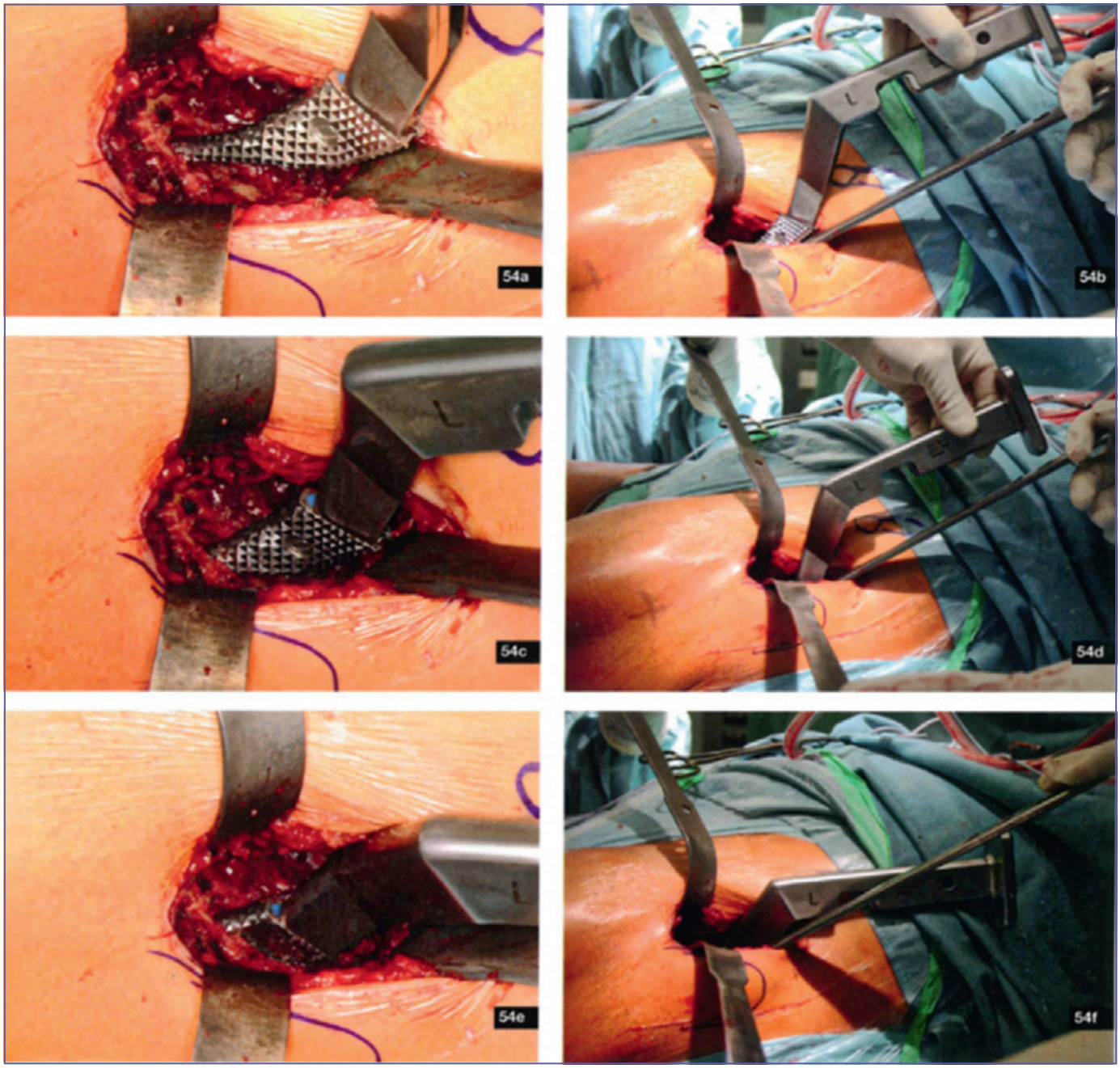

Figure 3. Surgical technique of direct anterior approach for hip arthroplasty.

derly people with poor bone quality, and therefore in selected cases, prosthetic replacement may be indicated (Fig. 5).

Post-operative management

Any treatment must include an adequate rehabilitation plan from the day following the operation with the possibility of weight load[9].

In fact, the choice of limiting load has little biomechanical justification, since the activities of daily living in bed produce forces greater than those of the axial load (e.g. positioning a bed pan).

Abstention from weight load does not prevent the breakdown of the synthesis; free weight load based on the level of pain maximizes the rehabilitation potential and is strongly recommended within 24-48 hours after surgery (as early mobilization improves outcomes).

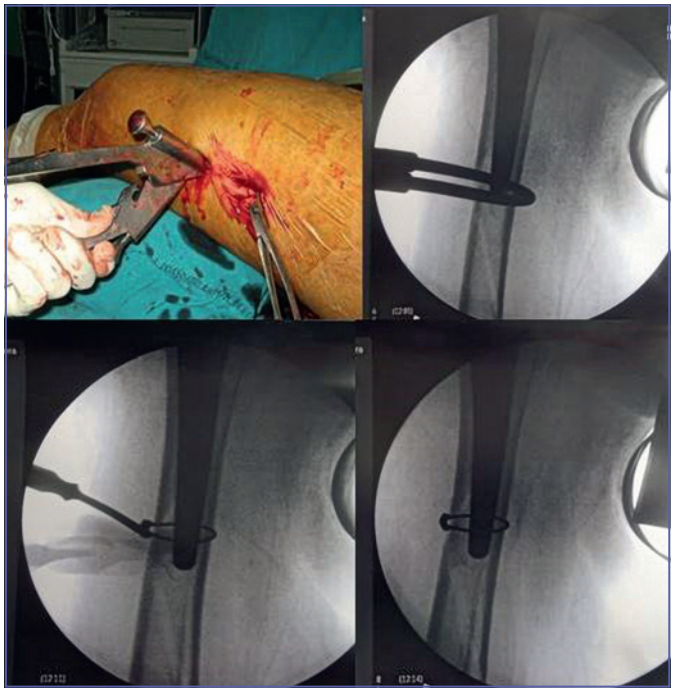

Figure 4. Minimally invasive technique for cerclage wiring.

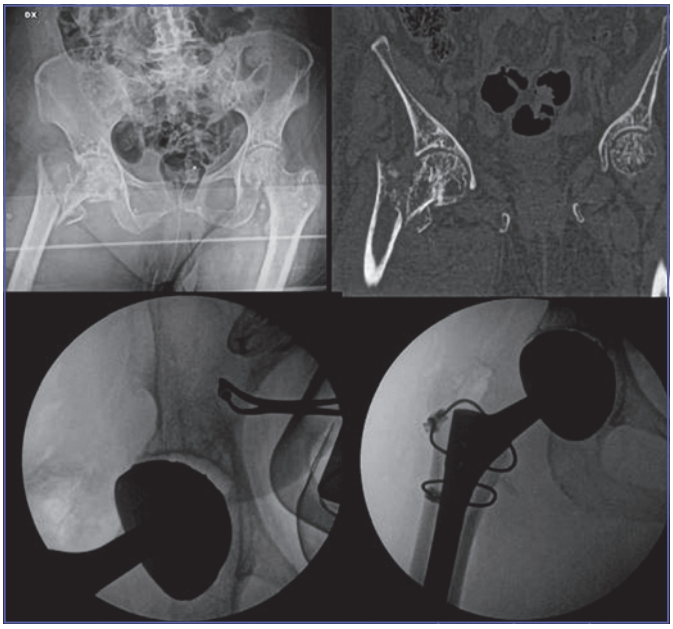

Figure 5. In elderly people with poor bone quality, and therefore in selected cases, prosthetic replacement may be indicated.

Acetabular fractures

Acetabular fractures are among the most challenging injuries treated by orthopedists. The incidence rate is three patients per 100,000/year [10], so even in a high-volume trauma center, the case load is low and it is therefore difficult to gain sufficient experience. There are many challenges in acetabular fracture surgery: the 3D morphology of the fracture is often complex and the choice of the surgical approach is not always simple. Surgical approaches are challenging and anatomical reduction, which is the most decisive factor for a good long-term outcome, can be difficult, even for the most experienced surgeons [11].

Acetabular fractures typically occur in young patients involved in high-energy trauma and in elderly patients who, with trivial falls, develop complex pictures of acetabular fracture due to osteoporosis. The most frequent type of fracture concerns the posterior wall, followed by fractures involving both columns and the transverse and posterior wall; other types of fractures are less common [12].

The universally adopted and used classification system is that of Judet and Letournel.

Accurate classification of acetabular fractures is therefore possible on the basis of x-rays, which represent the first step in the decision-making process. The second step is 2D CT, which can detect many important details that cannot be seen with x-ray alone. The imaging process ends with 3D CT, which allows to obtain a more accurate characterization of the fracture to classify it in the best possible way; this facilitates the choice of surgical routes and anticipates the maneuvers to be performed to obtain good reduction [13].

According to the AO principles, nonoperative treatment is reserved for compound fractures, fractures that do not involve the roof and the loading surface, low fractures of the anterior column, small fractures of the posterior wall stable and without dislocation, low transverse fractures with intact roof arch > 45°, and fractures of the two congruent columns in patients with low functional requirements [14].

Surgical treatment is reserved for displaced fractures, in cases of joint incongruity or insufficiency of the residual surface of the acetabular roof [14].

The aim of surgical treatment is to obtain accurate reduction and restoration of joint congruence (Figs. 6,7.1,7.2).

In some cases, prosthetics may be indicated in patients over the age of 75 through the use of multi-hole cups (with bone graft with morselized femoral head positioned on the acetabular fundus); which allow through the screws to perform an internal synthesis of the acetabular fragments (Fig. 8).

In geriatric cases, as reported by the AAOS, it is necessary to recover the continuity of the posterior column with a plate, and then place multi-hole cups stabilized with screws or cages with cemented cups (Fig. 9); if the fracture involves all the columns and the lamina, after having recovered the continuity of the posterior column through a plate, the positioning of an iliac grip cup allows optimal stability and the possibility of weight load in the immediate post-operative period (Fig. 10).

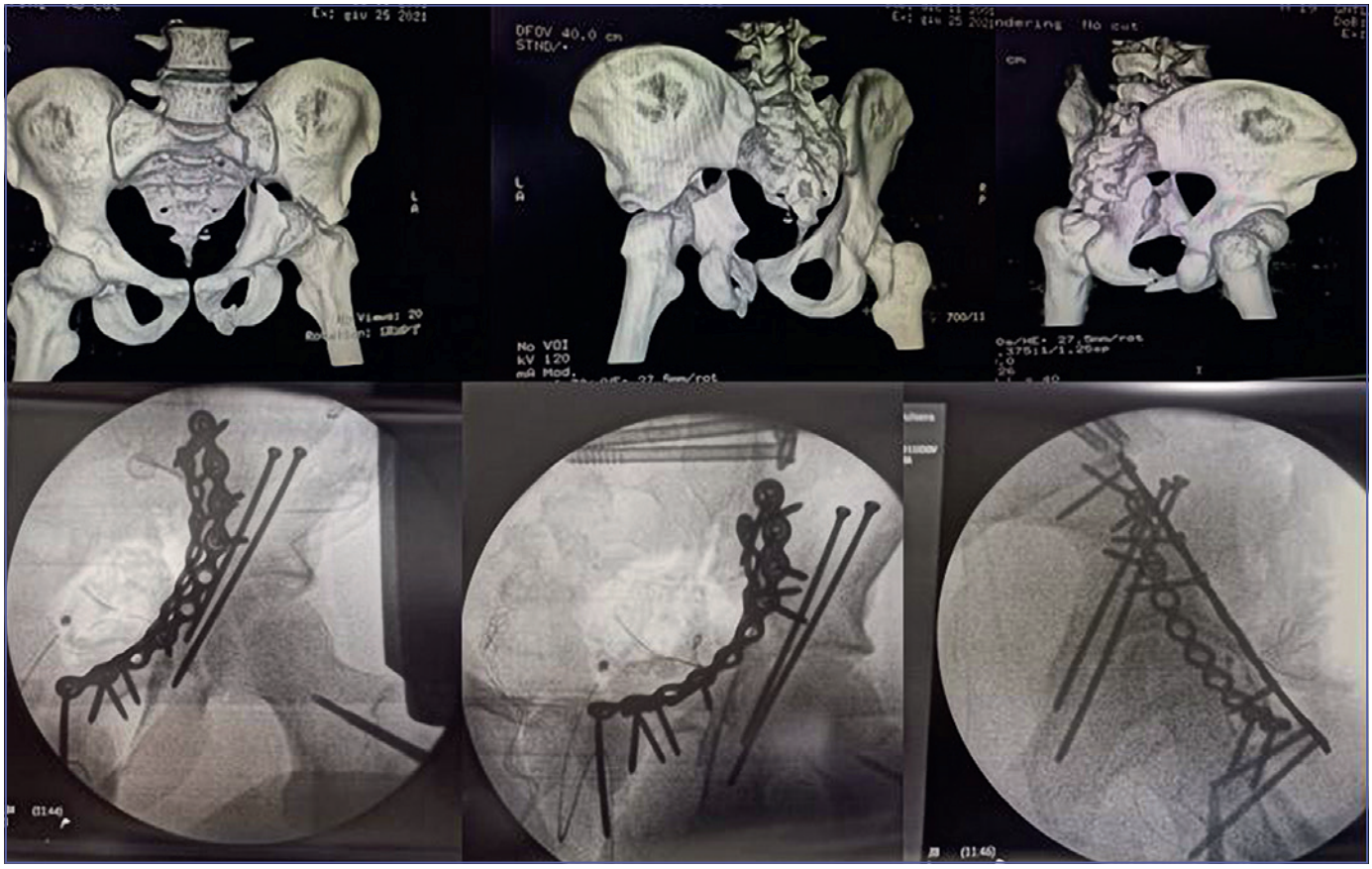

Figure 6. 19 years old young man: complex pelvic fracture treated with screw and plates.

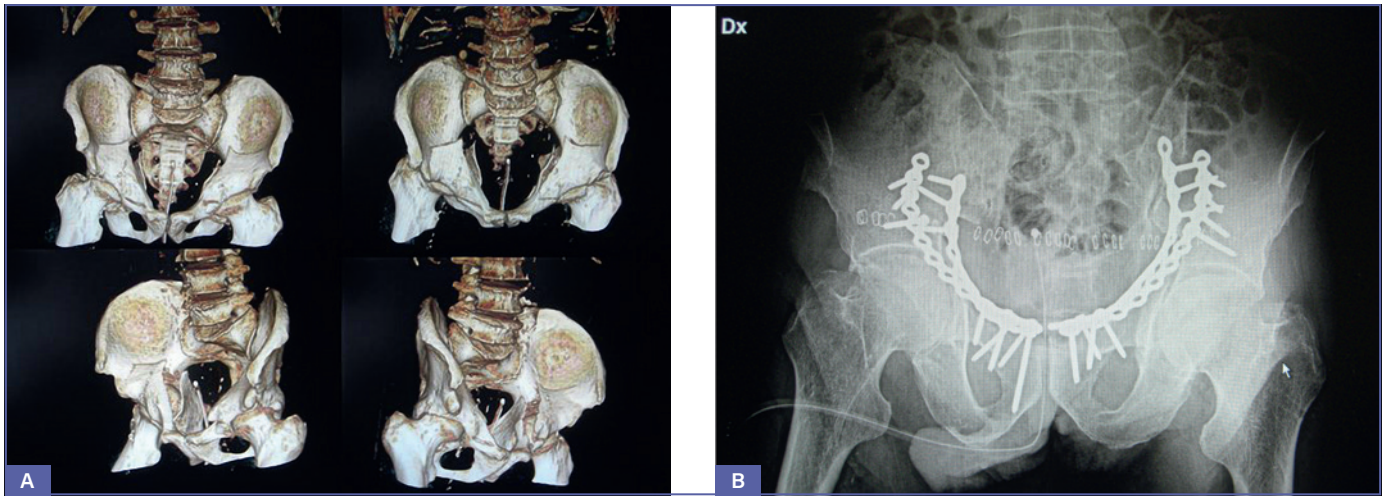

Figure 7A-B. 81 years old man: complex pelvic fracture treated with plates.

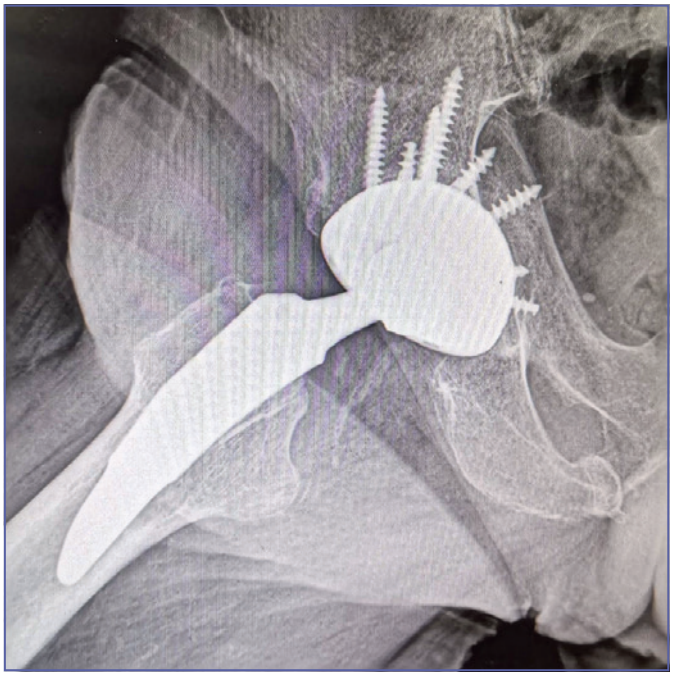

Figure 8. Multi-hole cup stabilized with screws.

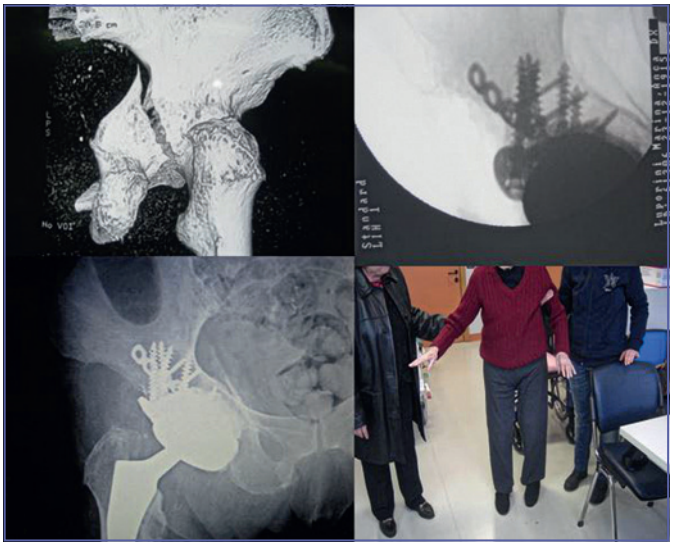

Figure 9. Example of reconstruction of posterior column in elderly patient.

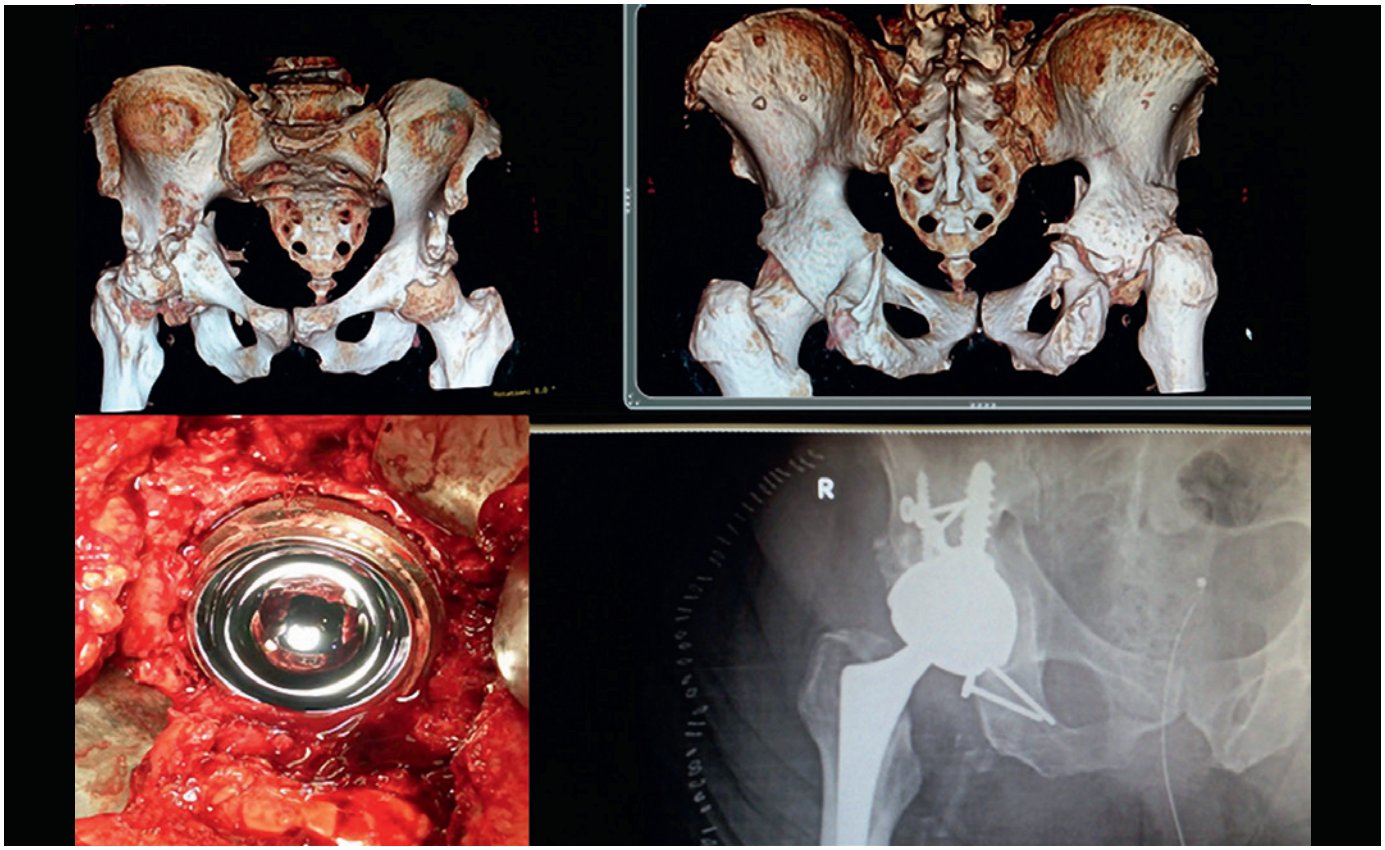

Figure 10. fracture involving all the columns and the lamina: an iliac grip cup allows optimal stability and the possibility of weight load in the immediate post-operative period.

Conclusions

In conclusion, in order to frame a coxofemoral fracture, the following is necessary: an accurate study of the fracture, meticulous classification of the fractured patient, evaluation of the various therapeutic options based on guidelines, best practices, and consolidated principles. It is essential to obtain an informed consent form that is as specific as possible on the various therapeutic options, to make a collegial and/or shared evaluation by planning personalized treatment, evaluate the surgical context in which one operates in order to minimize complications and achieve the best possible results. The elements conditioning the results are the type of fracture, stability of the reduction, method of fixation and/or replacement and, particular attention to the type of patient, comorbidities, and functional requirements.

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Conflict of interest statement
The Authors declare no conflict of interest.

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Authors' contributions
MM, AB, MA, SP contributed to the design and implementation of the research, to the writing of manuscript and literature review.
SA contributed to the photo editing of surgical cases.
MM supervised the project.

Ethical consideration
This study was approved by the Institutional Ethics Committee (not applicable).
The review was conducted ethically.
Written informed consent was obtained from each patient for surgical and x-ray images publication.

References

1 Veronese N, Maggi S. Epidemiology and social costs of hip fracture. Injury 2018;49:1458-1460. https://doi.org/10.1016/j.injury.2018.04.015
2 Società Italiana di Ortopedia e Traumatologia. Fratture del femore prossimale nell'anziano. Linea guida SIOT 2021 (https://siot.it/lineeguida-fratturafemore2021).
3 LeBlanc ES, Hillier TA, Pedula KL, et al. Hip fracture and increased short-term but not long-term mortality in healthy older women. Arch Intern Med 2011;171:1831-1837. https://doi.org/10.1001/archinternmed.2011.447
4 Garden RS. Reduction and fixation of subcapital fractures of the femur. Orthop Clin North Am 1974;5:683-712.
5 Nurmi I, Narinen A, Lüthje P, et al. Functional outcome and survival after hip fracture in elderly: a prospective study of 106 consecutive patients. J OrthopTraumatol 2004;5:7-14. https://doi.org/10.1007/s10195-004-0033-x
6 Griffiths R, Alper J, Beckingsale A, et al.; Association of Anaesthetists of Great Britain and Ireland. Management of proximal femoral fractures 2011: Association of Anaesthetists of Great Britain and Ireland. Anaesthesia 2012;67:85-98. https://doi.org/10.1111/j.1365-2044.2011.06957.x.
7 Rockwood C, Bucholz R, Heckman J, et al. Rockwood & Green's fractures in adults 5th Ed. Lippincott: Wilkins & Williams 2001.
8 Bhandari M, Swiontkowski M. Management of acute hip fracture. N Engl J Med 2017;377:2053-2062. https://doi.org/10.1056/NEJMcp1611090
9 American Academy of Orthopaedic. Surgeons management of hip fractures in older adults evidence-based clinical practice guideline (https://www.aaos.org/hipfxcpg.pdf, Published Dec 3, 2021).
10 Bhandari M, Swiontkowski MD, Swiontkowski MD. Management of acute hip fracture. N Engl J Med 2017;377:2053-2062. https://doi.org/10.1056/NEJMcp1611090
11 Ziran N, Soles GLS, Matta JM. Outcomes after surgical treatment of acetabular fractures: a review. Patient Saf Surg 2019;13:16. https://doi.org/10.1186/s13037-019-0196-2
12 Pascarella R, Cerbasi S, Sangiovanni P, et al. Gestione e trattamento delle fratture acetabolari. Lo Scalpello Journal 2019;33:23-29. https://doi.org/10.1007/s11639-019-00305-3
13 Cimerman M, Kristan A, Jug M, et al. Fractures of the acetabulum: from yesterday to tomorrow. Int Orthopaedics (SICOT) 2021;45:1057-1064. https://doi.org/10.1007/s00264-020-04806-4
14 Buckley RE, Moran CG, Apivatthakakul T. AO Principles of fracture management, 3rd Ed. New York, NY: Thieme 2018, pp. 1120.