Hip lateral fractures. First 100 cases treated with the stabilization system of percutaneous compression plating

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Abstract

Introduction: The use of percutaneous compression plating with minimally invasive techniques is a valid alternative for the treatment of the hip lateral fracture. It has proved, especially in the group of unstable fractures, to reduce intra- and post-operative complications (shorter surgical time and lesser bleeding).

Materials and methods: We treated consecutively 100 cases of hip lateral fracture between 2005 and March 2013. Seventy-four percent of them were type 31A2.2 and 31A2.3 unstable fractures whereas 26% were type 31A2.1 stable fractures, as stated by the AO classification. Average age was 76.46 years old.

Results: In all patients we got anatomic bone setting both in anterior-posterior and lateral X-rays. Average surgical time was 29.94 minutes. Fluoroscopy use average time was 62.5 seconds. Average post-operative blood transfusion was 0.06 units. Average fracture collapse was 1.94 mm. We considered there was radiologic bone healing when we verified such 12 weeks after the surgery.

Conclusions: Using percutaneous compression plating for the treatment of the hip unstable lateral fracture we got excellent results, with considerable decrease in surgical time and less need of blood transfusion. The possibility to perform adequate stabilization of fractures involving the lateral bone wall percutaneously with minimal muscle and tissue injury makes this method the likely new reference pattern for this type of fractures.

Key words: Percutaneous compression plating; fracture; lateral; hip; hip dynamic system.

Level of evidence: III

Fracturas laterales de cadera. Cien primeros casos tratados con el sistema de estabilización con placa de compresión percutánea

Resumen

Introducción: El uso de la placa de compresión percutánea con técnica mínimamente invasiva es una alternativa válida para el tratamiento de las fracturas laterales de cadera. Se ha demostrado, sobre todo en el grupo de fracturas inestables, una reducción de las complicaciones intraoperatorias y posoperatorias (menor tiempo quirúrgico y menor sangrado).

Materiales y Métodos: Se trataron, en forma consecutiva, 100 casos de fracturas laterales entre 2005 y marzo de 2013. El 74% eran fracturas inestables de tipos 31A2.2 y 31A2.3 y el 26%, fracturas estables 31A2.1 de la clasificación AO. La edad promedio era de 76.46 años.

Conflicto de interés: Los autores no declaran conflictos de intereses.

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Resultados: En todos los pacientes, se consiguió una reducción anatómica tanto en el frente como en el perfil radiológicos. El tiempo promedio de cirugía fue de 29.94 minutos. El tiempo promedio de uso de radioscopia fue de 62.5 segundos. La media de transfusiones de sangre poscirugía fue de 0,06 unidades. El colapso promedio de la fractura fue de 1,94 mm. Se consideró que había curación radiológica a las 12 semanas, en todos los pacientes.
Conclusiones: El empleo de placa de compresión percutánea para el tratamiento de las fracturas laterales inestables logró excelentes resultados, con una disminución ostensible del tiempo quirúrgico y una menor necesidad de transfusiones sanguíneas. La posibilidad de realizar una adecuada estabilización de las fracturas con compromiso de la pared lateral, en forma percutánea, con un mínimo daño muscular y tisular, determina que este método sea probablemente el nuevo patrón de referencia para este tipo de fracturas.

Palabras clave: Placa de compresión percutánea; fractura; lateral; cadera; sistema dinámico de cadera.
Nivel de Evidencia: III

Introduction

Surgical treatment in hip lateral fractures is difficult, because it is associated with high rates of complications arising from both the procedure itself and the patient (old age and underlying medical conditions). Percutaneous compression plating is a minimally invasive procedure which, as previously reported, reduces post-operative complications; it mainly decreases blood loss and surgical time. We evaluated medical and radiologic results using this type of implants in our first 100 cases, operated on between 2005 and March 2013. We included patients with Tronzo A, Tronzo B and AO classification's types 31A2.1, 31A2.2 and 31A2.3 fractures (Figure 1).

We evaluated surgical time, surgical bleeding, need of post-operative transfusions, hospitalization time, collapse at week 12, and secondary complications. This study shows mainly the advantages of this type of implants in unstable fractures, in which it is possible to get adequate bone setting and appropriate control of collapse, minimal blood loss and low rates of complications in patients with comorbidities.

Materials and methods

One hundred patients were subject to stabilization with percutaneous compression plating between 2005 and 2013. We used the Tronzo's classification (hip lateral fractures) and the AO classification to determine the type of fracture and the number of cases within each group.

First we used this plate in both stable (31A1) and unstable (31A2) fractures, and after the initial learning curve, we only used this method in patients with unstable and multi-fragment fractures. We included patients with Tronzo IIIA and IIIB fractures and excluded those with inverse fractures or subtrochanteric fracture lines.

We used this method in two patients aged 16 and 28 years old, with high energy trauma, who were excluded from the study. Average age was 73.46 years old (ranging from 66 to 99). All the patients were treated within the first 72 hours of hospitalization.

Patients received spinal anesthesia. They were classified with the Singh's radiologic method (Figure 2). Seventy-four percent of the fractures were types 31A2.2 and 31A2.3 whereas 26% were type 31A2.1 (Figure 3).

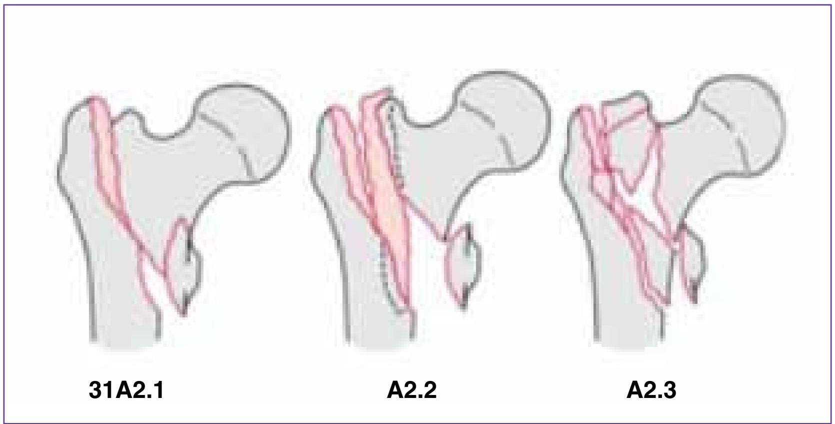

Figure 1. AO classification of unstable hip lateral fractures.

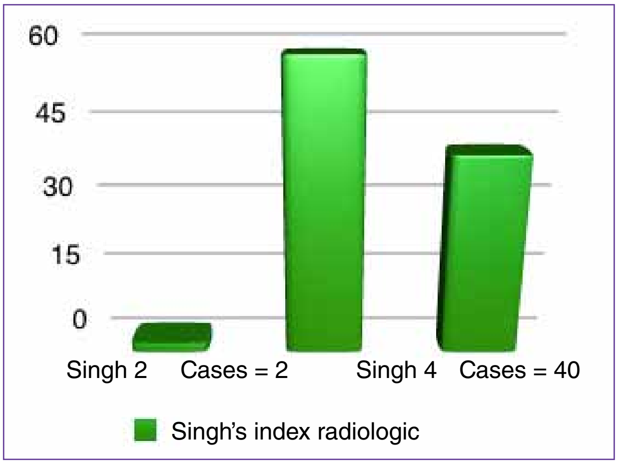

Figure 2. Distribution of the cases by the Singh's index.

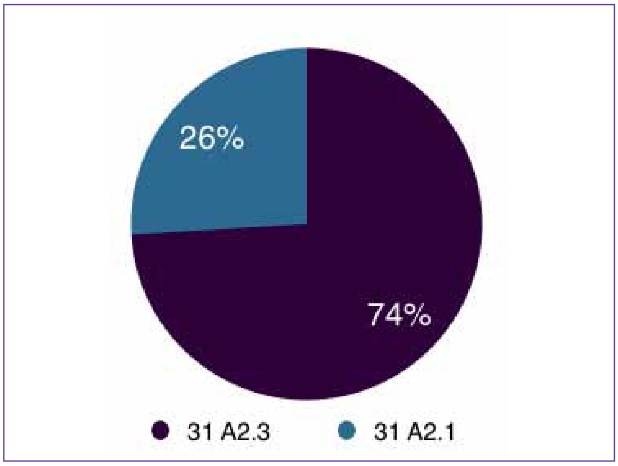

Figure 3. Distribution of the cases by type of fracture. AO classification.

Surgical technique

The patient is operated on using a traction operating table; appropriate fracture setting both on the anterior-posterior and the lateral plane is checked with fluoroscopy. At the time of using this implant, before surgery draping it is essential to check the anterior-posterior plane of the fracture overlapping a template with the drawing of the implant on the fluoroscope screen, what allows the surgeon to verify that, with the fracture already set, it is possible to insert appropriately the two head screws within the neck and the femoral head; moreover, it is necessary to check fracture anatomic setting on the lateral plane, 180º head-diaphyseal angle, what we have a posterior setting device for (Figure 4), which is coupled with the operating table. This device avoids the posterior angular deviation these types of fractures are usually associated with. With the fracture anatomically set and checked under fluoroscopy, antiseptic painting and draping comes. First it is necessary to determine, with the aid of an identical-to-the-implant template that overlaps the bones on the fluoroscope screen, what the position of the implant will be with respect to the proximal third of the femur so as to insert the two head screws through the femoral neck.

Figure 4. Posterior setting device.

The first incision is 3-cm length and goes proximal to the lesser trochanter base; in the case this one is fractured, the template can be taken as reference; the fascia is cut so as to get to the bone; the bevel shape of the distal end of the plate makes it possible to slide the plate through this first incision under the vastus lateralis muscle. The proximal-distal position is checked through the template. At that moment, the fixation proximal screw is inserted checking anterior-posterior cortex equal distance on the femoral diaphysis. The second incision is 2.5 cm-length and goes at the level of the second hole of the insertion arch diaphyseal screws; the autostatic davier of the plate is slid on the anterior femoral cortex and it is fixed to the insertion arch; this way, the position of the plate is fixed (Figure 5). Position is checked fluorocopically on both the anterior-posterior and the lateral planes; it is essential that the plate is perfectly aligned with the femoral diaphysis (Figure 6).

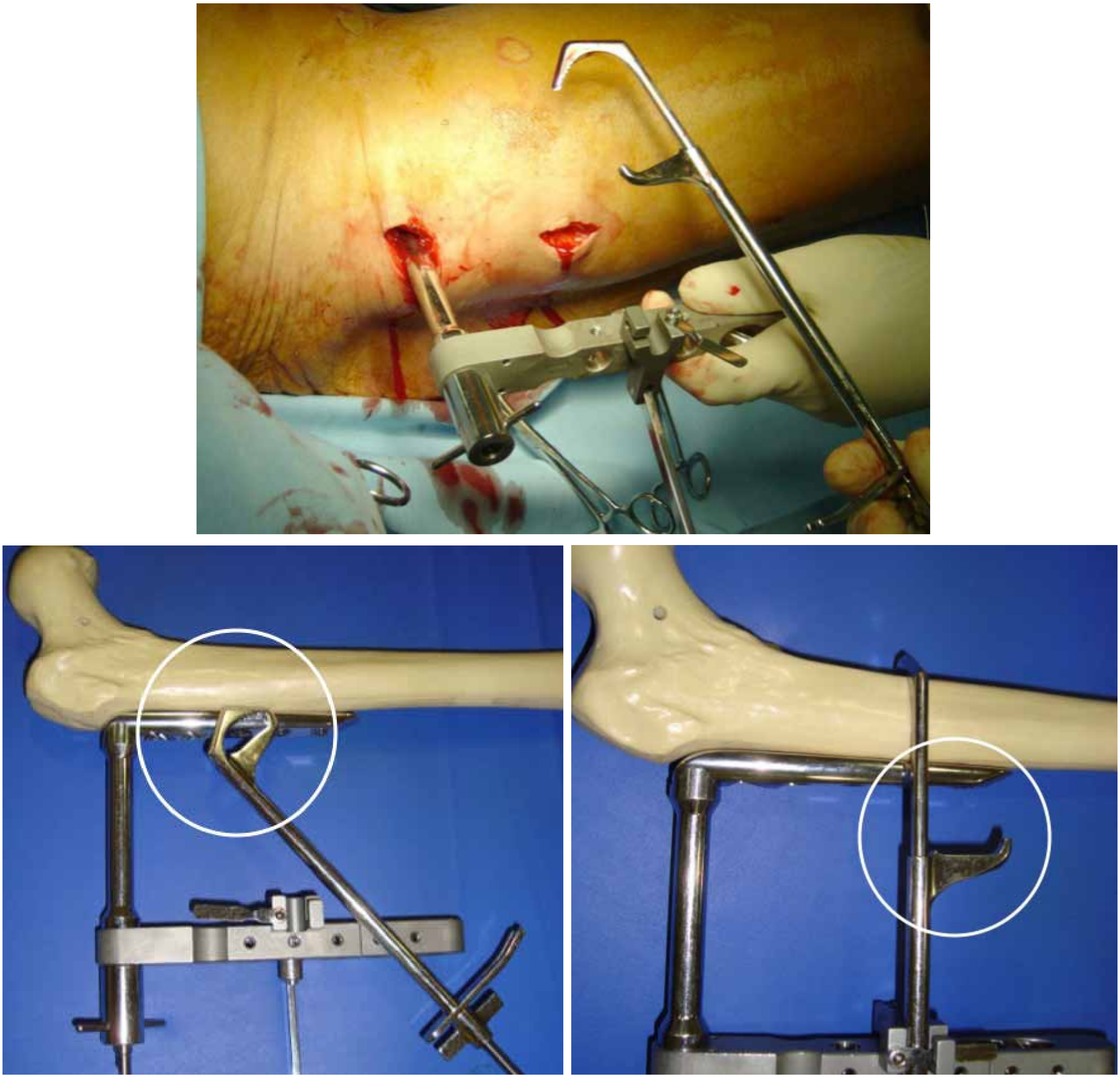

Figure 5. Autostatic system of percutaneous fracture setting.

Figure 6. Correct alignment both on the anterior-posterior and the lateral planes.

Then, it is necessary to insert the head screw which is nearer the calcar femorale, following the sequence of guides for measurement and reaming. Afterwards, the insertion of one of the cortical screws comes and, this way, the system is perfectly fixed. The next step consists of removing the proximal screw so as to have access to the femoral neck with the second head screw. Then osteosynthesis is completed with the two remaining diaphyseal screws, and then the insertion arch is uncoupled. Surgical lavage is performed on the two incisions and, with no need of blood drainer, the incisions are closed (Figure 7).

Figure 7. Final post-operative results. Two approximately 2.5 cm-length.

Results

We got adequate fracture setting in all cases using a traction orthopedics operating table with appropiate insertion of the two head screws (Figure 8).

Average surgical time was 29.94 minutes (ranging from 12 to 58). Average fluoroscopy use time was 62.5 seconds (ranging from 38 to 87). The need of blood transfusion was: one patient (1 unit) during the surgery, and one patient (3 units), three patients (2 units) and two patients (1 unit) after the surgery.

All patients started rehabilitation without weight bearing 24 hours after the surgery; they were allowed to sit on the edge of the bed, what decreased considerably the risk of complications for bed-confinement and improved respiratory mechanics. Average time of hospitalization was three days. Fracture healing time was, on average, 12 weeks. Assisted partial weigh bearing was allowed after stitches removal two weeks after the surgery in stable fractures and from four to six weeks after the surgery in the case of unstable fractures. Walking always started aided by kinesiology and with the aid of a walker. One pa-

Figure 8. Post-operative radiologic results. Correct setting and head screws position.

tient passed away in the immediate post-operative period (7 days after the surgery) due to undetermined causes.

With respect to the complications, it is worth mentioning the need of conversion to hip total replacement in two cases due to necrosis and head collapse. One of these patients passed away after the surgery due to a serious occlusive abdomen event.

In the anterior-posterior X-ray of both hips, we performed millimetric measurement of the degree of the head screw impaction. This impaction was evaluated in the first post-operative X-ray with standard techniques and, then, it was compared to the X-ray taken 12 weeks after the surgery. We measured the length of the more proximal head screw: (S1/T1) – (S2-T2), where S stands for total length and T represents the real lengths of the screw threading, which is 15 mm. We verified average impaction of 1.94 mm.

Only in one case there was collapse of 20 mm, which was the greatest one in our series.

Discussion

Fractures of the proximal femur, including those that affect the inter-trochanteric region of the bone, have become a problem difficult to solve and associated with high health costs. These types of fractures occur in 250,000 American inhabitants per year, and predictions for 2040 are of 500,000 cases per year. Due to the population greater longevity, we have to operate on patients progressively old, who, sometimes, suffer significant comorbodities. However, the surgical indication is out of the question, due to the considerable morbi-mortality related to prolonged rest in bed. There is a wide availability of surgical treatments for these types of fractures.

Osteosynthesis with 135-150º dynamic hip screw (DHS) is considered the "reference pattern"[1] for AO classification's types 31A1 and A2 femur inter-trochanteric fractures. However, most studies have failed to show significant differences in medical and radiologic results while comparing DHS to intramedullary systems in hip fracture.[2,3] Short intramedullary nails involve the risk of femoral diaphyseal fracture, misalignment and non-union (12%), proximal and distal locks misplacement (15%), cutout (2-4%), and post-operative hematoma (4%); therefore, some authors[4-7] discourage routinely use of this type of procedures for stable fractures, and suggest that they should be used only in the case of unstable fractures, multi-fragment fractures and sub-trochanteric fractures.[8] Most early studies that compare DHS to percutaneous compression plates assess mistakenly the different types of fractures. In unstable fractures, biomechanical and surgical analysis should be carried out comparing percutaneous compression plating to DHS systems with supplement of trochanteric stabilization plating, which demands longer surgical times and causes more bleeding and high complication rates.[9]

The rate of head screws failure in percutaneous compression plating is really low; in most publications is <4.5%, what coincides with our series, in which there was no such complication in 100 cases,[10-12] compared to 4-10% for other types of osteosynthesis, as seen in specialized bibliography.[13] This low failure rate could be related to the two screws at the level of the femoral neck and head, what increases twisting stability,[14,15] but, at the same time, allows impaction at the fracture site level because of the fact that these two screws are parallel. The possibility to have a lateral supporting band and the lower incidence of lateral wall fracture (29.8% in DHS vs. 1.9% in percutaneous compression plating in unstable fractures) decreases the risk of collapse.[16] The degree of stability and the lack of collapse due to the system lateral support allows weight bearing immediately in the patients with stable fracture, with 100% of healing at month three.

Minimally invasive surgery contributes to a better post-operative status and fast rehabilitation.

Most of the articles revised suggest that peri-operative blood loss with percutaneous compression plating is lower.[17-20] This decreases transfusion rates, which Bierbaum[21] relates to greater post-operative morbidity, with higher infection rates.

As it happens with every new method, some authors suggest that the learning curve is high and, therefore, surgical time is long until this drawback is overcome. We were able to do with the learning curve in the first 10 or 12 cases, time in which we verified the advantages that led us to carry out this work. What is more, this type of osteosynthesis allows better management of soft tissues, bleeding reduction, less cardio-respiratory complications and faster walking.

In our country, there are reports of techniques using the classical DHS associated with a minimal approach with favorable results.[22,23] Among advantages, we highlight as similar to our study's, lower rates of intra-operative bleeding, shorter hospitalization time and immediate improvement in terms of well-being—all this, with no changes in healing time as compared to the traditional method.

Conclusions

Fixation of both stable and unstable hip lateral fractures can be carried out with percuteneous stabilization plating, which gives excellent medical and radiological results. It is a technique that, after a short learning curve, can give results quite good and predictable.

In our study, we got excellent results with considerable decrease in the complications rates. In all the cases, we got healing fracture with no failure of the osteosyntheis material. The possibility to perform adequate stabilization percutaneously with minimal muscle and tissue injury, very low bleeding and reduced surgical time makes this method the likely new reference pattern for this type of fractures.

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