Surgical Options in the Treatment of Peri-Implant Femoral Fractures

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SURGICAL OPTIONS IN THE TRATAMENT OF PERI-IMPLANT FEMORAL FRACTURES (Abstract) Aim: Hip fractures tend to increase as a global number-approx. 300,000/year. Life expectancy of the population is increasing, implicitly the diseases associated with the advanced age are increasing. At the same time, the number of peri-implant fractures (PIF) is increasing. These types of fractures usually have their headquarters at the base of the implant where poor quality bone comes into contact with the rigid implant. Our aim is to identify the factors that influence the production of these types of fractures and to optimize their treatment. Material and methods: We analyzed for 6 months, 4 patients with peri-implant fracture of the femur in terms of age, sex, place of origin, type of fracture, treatment type. The surgical treatment applied was different from case to case with favorable postoperative evolution. Results: The results from surgical interventions were optimal, assessing fracture stability, restoring mechanical stability, respecting the biological environment, and choosing the right fixation device. Conclusions: Peri-implant fractures are a distinct topic in fractures. The long-term implant can alter the bone structure, and may complicate the healing or placement of a new implant, making treatment a challenge for the surgeon. Keywords: HIP FRACTURE, PERI-IMPLANT FRACTURE, IMPLANT, SURGICAL TREATMENT.

PIF represent an important problem for the health system due to their increased incidence, the high average age of the affected population and the exorbitant costs that the treatment implies. As the number of implants used in orthopedics increases, it is inevitable that associated fractures become even more common (1, 2).

The trochanteric fractures that generate a large number of PIF account for about half of the total fracture of the upper femoral extremity, although there are also estimates that their number may be 4 times greater than that of the cervical fractures (3). Trochanteric fractures generally occur as a result of high intensity and energy trauma caused by height drops or traffic accidents in young people or hip failure in elderly patients with osteoporosis (4).

The PIF are due to the same forces that cause fracture without the presence of an implant, but on the background of a damaged bone tissue (5) and usually have their headquarters at the base of the implant, where poor quality bone comes into contact with the rigid implant (6).

The treatment of these fractures depends on the age of the patient, the pres-
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ence of multiple associated co-morbidities influencing the prognosis, conservative or surgical treatment.

MATERIAL AND METHODS
We analyzed 4 cases of PIF admitted to Orthopedic Clinic of “Sf. Spiridon” County Clinical Emergency Hospital from Iasi between January - June 2017. The data were obtained from the general clinical observation sheets. We analyzed: demographics characteristics of patients: gender, age, origin, type of fracture, interval between first surgery to second fracture (tab. I).

TABLE I
Data analyzed: demographics characteristics, type of fracture, interval between first surgery to second fracture

<table>
<thead>
<tr>
<th>Gender</th>
<th>Age (years)</th>
<th>Place of origin</th>
<th>Type of fracture</th>
<th>Second fracture (months)</th>
</tr>
</thead>
<tbody>
<tr>
<td>S.M.</td>
<td>Female</td>
<td>76</td>
<td>Urban</td>
<td>Intertrochanteric fracture</td>
</tr>
<tr>
<td>E.I.</td>
<td>Female</td>
<td>97</td>
<td>Rural</td>
<td>Trochanteric fracture</td>
</tr>
<tr>
<td>T.V.</td>
<td>Male</td>
<td>64</td>
<td>Rural</td>
<td>1/3 middle femur fracture</td>
</tr>
<tr>
<td>C.C.</td>
<td>Female</td>
<td>59</td>
<td>Urban</td>
<td>Intertrochanteric fracture</td>
</tr>
</tbody>
</table>

CASE REPORTS

Case 1: S.M., Left intertrochanteric fracture operated. Treatment: hardware removal and fracture fixation with a long Gamma nail.

Fig. 1. Peri-implant fracture

Fig. 2. Postoperative radiographic
Fig. 3. Postoperative radiographic.

Fig. 4. Postoperative radiographic

Case 2: E.I., Right trochanteric fracture operated, viciously healed. Treatment: hardware removal and fracture fixation with a femoral nail.

Fig. 5. Right trochanteric fracture, viciously strengthened
Fig. 6. Peri-implant fracture
Fig. 7. Postoperative radiographic

Case 3: T.V., 1/3 middle right femur fracture. Treatment: hardware removal and fracture fixation with a DCS and 3 Dall-Miles Cables.
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Fig. 8. Peri-implant fracture

Fig. 9. Peri-implant fracture

Fig. 10. Post-operative anteroposterior view

Fig. 11. Intramedullary nail fixation is present

Case 4: C.C., Left intertrochanteric fracture operated. Treatment: hardware removal and fracture fixation with long Gamma nail.
DISCUSSION

Fractures around implants pose unique fixation challenges. The original placement of the implant may predispose to later fracture, the long-term presence of the device may change the structure of the bone and increase susceptibility to fracture, and the implant itself may interfere with healing or the placement of other fixation devices (7, 8).

The techniques for treating PIF may be more difficult, with more limited options and more frequent complications than the techniques used in treating fractures without the presence of an implant.

Treatment of PIF requires strict adherence to the basic principles of treating any fracture. The surgeon must restore the biomechanical integrity of the bone. This requires restoration of a biologic environment in which the bone can heal and a mechanically stable construct to give the bone a chance to heal.

Biology is maintained by strict soft-tissue and indirect reduction techniques, when possible, to preserve periosteal or endosteal blood supply. The surgeon should minimize periosteal stripping, avoid dead space, and consider bone grafting if the biological environment is compromised. The patient’s medical condition should be optimized. The patient should be encouraged to stop smoking when applicable.

Mechanical stability is obtained by restoring the anatomic integrity of the bone and by following AO principles with adequate fixation distal and proximal to the fracture (9).

Essentially, all PIF require treatment, and surgical options include the following: a) Revising the implant by placing a new implant, which also stabilizes the fracture; b) Fixing the bone around the implant which include intramedullary devices (rods, nails) and extramedullary devices
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(plates, screws)

CONCLUSIONS

Fractures were usually located at the base of the implant, where poor quality bone comes into contact with the rigid implant, due to the difference in resistance between the osteoporotic bone and the implant used for osteosynthesis of the primary fracture.

In our cases PIF represent a challenge because they have presented technical difficulties in fixation and all cases have required surgery. In all cases the stabilization of the fracture focal point was sought, either by implant replacement or by keeping the implant and stabilization.

In geriatric patients with low bone mineral density, we think that diaphysis equal length centromedulary implants offer proper transfer of mechanical stress, preventing peri-implant fractures. Particularly, in proximal hip fractures in geriatric patients we think that long Gamma Nail offer better stability and protection against peri-implant fractures.

REFERENCES