

# Reconstruction of a Traumatic Bone Defect from Distal Femur

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## Learning Point for this Article:

The treatment of traumatic bone loss is difficult and under certain circumstances, in a disadvantaged environment, it may be necessary to reintegrate a bone fragment expelled on the ground with very satisfactory results."

## Abstract

**Introduction:** Bone defect is a difficult problem in orthopedics. The treatment conventionally relies on techniques such as induced membrane, grafts, and elongations. The reintegration of an externalized osseous fragment involves significant infectious risks but is essential in certain situations.

**Case Report:** We report the case of a 10 cm traumatic bone loss of the right distal femur in a 35-year-old woman. Treatment consisted of paring, reintegration and stabilization by the external fixative. The 5-year follow-up was satisfactory with good consolidation and good function of the limb.

**Conclusion:** The reintegration of a bone fragment of limb expelled onto the soil is rare. We tried it because the response time was very short, but also and especially because the fragment was expelled on very hot bitumen. These two elements limited the risk of infection and favored the osseointegration of the fragment. We have not found a similar case reported in the literature allowing comparisons and recommendations.

**Keywords:** Traumatic, bone, loss, reconstruction.

## Introduction:

The reconstruction of diaphyseal bone segments remains a major challenge in the conservation of limbs regardless of the etiology of bone defect. This problem is still poorly solved by classical techniques, and amputation of the limb is still relevant. The most common methods are vascularized bone transfer (fibula), the segmental transfer method according to Ilizarov, and the sequential method of the induced membrane according to Masquelet. Bone autograft is not recommended when the loss of substance exceeds 4–5 cm. Beyond 6 cm, autologous bone grafts undergo a phenomenon of resorption even in a well vascularized muscular environment [1, 2]. We report a 10 cm traumatic bone loss of the right distal femur which we treated by trimming, reintegration, and stabilization by an external fixator.

## Case Report:

Mrs. M.S., aged 35, was in the back of a motorcycle driven by her husband when they were hit by a motor vehicle. She dropped on the tar with the open trauma of the right thigh, expelling a bone fragment about 10 cm long on the pavement. The exact mechanism could not be specified. The patient was taken to the university hospital within 1h, with the expelled bone fragment packed in a plastic bag. On admission, the fragment was recovered and stored in physiological saline (Fig. 1). Clinical examination had a clear consciousness with Glasgow score = 15/15 and shock with blood pressure = 90/50 mm Hg and pulse rate = 110 pulses/min. The hemoglobin level was 8 g/dl. It was, therefore, a picture of polytrauma. The cutaneous opening, Type II of Gustilo-Anderson, was hemorrhagic and located at the anterolateral side of the thigh above the knee. The patient immediately received a transfusion of two globular pellets,

## Author's Photo Gallery



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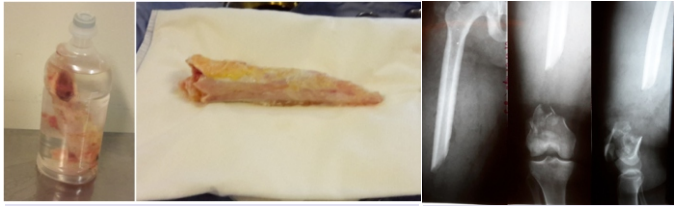
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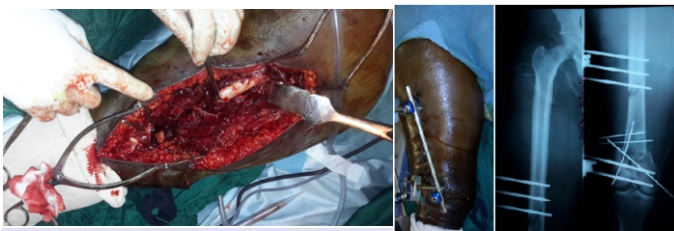
**Figure 1:** The fragment recovered and preserved in physiological saline.

**Figure 2:** Metaphysis-epiphyseal bone defects.

tetanus prevention and 2 g of ceftriaxone. The radiograph of the femur had objectified a metaphysis-diaphyseal bone defect associated with an intercondylar split (Fig. 2). At about the 3rdh after her trauma, the patient was admitted to the operating room. The fragment was treated with physiological saline, then with 10 volumes hydrogen peroxide, and rinsed again with saline. After wound trimming, the fragment was reintegrated and reduced. The assembly was stabilized by an external Hoffmann II fixator (Fig. 3 and 4). The surgical follow-ups were marked by superficial suppuration during the 2nd week. The pyoculture isolated a golden Staphylococcus, effectively treated with a triple combination of ceftriaxone, gentamycin, and metronidazole. Skin healing was obtained at the 3rd week. The physiotherapy was undertaken from the 4th week. Clinical and radiological consolidation was effective in the 7th, but the external fixation was only removed at the 9th post-operative month. At the 5-year follow-up, walking is normal, without limping. However, there are episodic and moderate mechanical gonalgia, a moderate stiffness of the knee with flexion limited to 100°. The result is considered satisfactory (Fig. 5 and 6).

### Discussion:

The reconstruction of bone loss is one of the major difficulties encountered in reconstructive orthopedic surgery. Autologous bone grafting from the iliac crest remains the reference treatment [3]. However, the amount of autologous bone available may be insufficient, and the morbidity at the sampling site is not negligible. The reference techniques for large losses of substance are vascularized bone transfer [1, 4], bone mobilization according to the so-called “elevator” technique [5, 6, 7, 8, 9], and the induced membrane [1, 10]. These are techniques that require technical mastery, an adequate technical platform and which are sequential, requiring several interventions. Failures are not uncommon. Our observation



**Figure 3:** The wound after excision showing the extent of bone loss.

**Figure 4:** External fixator stabilization.



**Figure 5:** Final result.

**Figure 6:** View of knee flexion at 5 years

took place in a semi-urban zone of a resource-limited country. The technical plateau is minimal, and care funding is provided directly by patients, who are often deprived. These facts limit the possibilities for reinterventions. Our attitude “reintegration of a bone fragment expelled on the road,” even if it appeared bold compared to the classic rules, could be justified by several considerations:

- Early intervention: we intervened within 3 hours of the trauma;
- The bone fragment was expelled onto the bitumen where the temperature was close to 50°. These two factors have undoubtedly contributed to limiting the infectious risk. The suppuration that we observed during the second post-operative week was probably related to the local conditions of asepsis and the opening of the focus when we know that open fractures are burdened in 10–30% of infectious complications [11].
- Moreover, the reintegration of the fragment that is similar to a bone autograft was done very early. The fragment was certainly still alive, which helped its rapid osseointegration. Most authors are convinced of the necessity of an early transplant, although paradoxically it is delayed [3]. At the 28th week the consolidation was acquired even if, as a precautionary measure, we delayed the removal of the fixer at 32 weeks. The delays reported in the literature are often much longer with conventional techniques [5, 6, 10, 9].

### Conclusion:

In all, it was a bold attitude that was beneficial, avoiding the patient multiple interventions in a precarious environment and with the result more than random. We have not found a similar case in the literature allowing comparisons or recommendations.

### Clinical Message

Bone reconstruction can sometimes be a real challenge when substance loss is important, especially in disadvantaged areas. The reintegration of a lost bone fragment is not described in the literature but maybe a saving solution under certain conditions.

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**Consent:** The authors confirm that Informed consent of the patient is taken for publication of this case report

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