



Treatment of aseptic non-union after intramedullary nailing without removal of the nail



Christos Garnavos

Orthopaedic Department of "Evangelismos" General Hospital, 45 Ipsilantou St, Athens 10676, Greece

ARTICLE INFO

Keywords:

Non-union
Delayed union
Intramedullary nailing
Long bone fracture
Without nail removal
Nail retention
Ultrasound/electrical stimulation
Nail dynamisation
Biological stimulation
Augmentation plating

ABSTRACT

Failure of bone healing after intramedullary nailing of a diaphyseal long bone fracture is a severe complication that requires an effective management to ensure the best chances for successful bone-union and termination of a long period of incapacity and morbidity for the sufferers. Traditional procedures require removal of the existing nail and re-fixation with wider nail, plate or external fixation constructs. The concept that bone union can be obtained with the existing nail in situ is gaining popularity as its removal adds trauma and potential complications and prolongs the operating time. This article reviews all techniques that have been proposed for the management of aseptic diaphyseal long bone non-unions that stimulate bone healing without removing the existing nail.

© 2017 Elsevier Ltd. All rights reserved.

Introduction

Uncomplicated diaphyseal fractures of the femur and tibia are universally treated with closed, locked intramedullary nailing that offers high healing rates and fewer complications if compared with other treatment methods [1,2]. Intramedullary nailing is less popular for the management of diaphyseal humeral fractures. However, whenever surgery is indicated, for a humeral shaft fracture the technique is gaining popularity among the orthopaedic surgeons over the last decades [3,4].

Aseptic non-union is a severe complication that can occur after the management of a long bone fracture with intramedullary nailing. It ranges from 0% to 12.5% in the femur and tibia while it happens more frequently in the humerus (10–15%) [2,5–9].

Several techniques have been described for the management of non-union that occurs after intramedullary nailing. Most frequently, the existing nail is removed and the non-union site is either re-reamed and re-nailed or fixed with plate or external fixation devices [10–14].

Despite the logical thinking that in the event of non-union the implant that has been initially used should be removed and replaced, the idea to retain the intramedullary nail and seek for adjuncts that will re-activate the healing process and avoid the, sometimes cumbersome, removal of the nail, appears equally attractive. As it is generally accepted that most diaphyseal long bone aseptic non-unions occur either due to insufficient biological

environment (atrophic non-union) or due to instability (hypertrophic non-union), it has been proposed that these non-unions could be treated either with the provision of suitable biological stimulus or by adding stability or both without removing the existing nail and thus reducing surgical trauma, operating time and complications. With common denominator the maintenance of the initially implanted intramedullary nail, proposed techniques include the use of electrostimulation or pulsed low-intensity ultrasound, dynamisation of the nail, use of external fixation over the existing nail, infusion of biological stimulus in the non-union site, and augmentation plating [15–23]. The aim of this article is to review the treatment methods that have been proposed for the management of diaphyseal long bone non-unions that occur after intramedullary nailing and do not require removal of the nail.

Ultrasound stimulation

On 1983 Duarte published the first report about the use of Low Intensity Pulsed Ultrasound System (LIPUS) for stimulating bone osteogenesis in animals [24]. Since then there have been several studies investigating the usefulness of ultrasound stimulation in the management of aseptic delayed unions and non-unions in humans with variable success. In a review published in 2008, Romano et al. reported that the stimulation of delayed-unions or non-unions through LIPUS had a healing rate from 70 to 93% in different non-randomised studies [25]. The authors mentioned that the advantages of ultrasound stimulation include the avoidance of additional complex operations for the treatment of non-unions, efficacy, safety, ease of use and favorable cost/benefit

E-mail address: cgarn@otenet.gr (C. Garnavos).

ratio. However, it was recognised that the use of ultrasound stimulation for the treatment of delayed-unions and non-unions has a long healing time, there was lack of randomised controlled studies and the correct indications for the effective application of the method were not broad. The final guidance of the National Institute of Clinical Excellence (NICE) in the United Kingdom regarding the use of EXOGEN ultrasound bone healing system for the management of non-unions or delayed healing of fractures concluded that although there is some radiological evidence that supports the use of the system in fractures with delayed healing, there were substantial uncertainties about the effectiveness of the system between 3 and 9 months after fracture. These uncertainties result in a range of cost consequences, some cost saving and others that are more costly than current management [26]. In a more recent review by Ebrahim et al. it was concluded that the evidence regarding the usefulness of ultrasound stimulation in delayed union and non-union is extremely weak, inconclusive and insufficient to support its use and the authors proposed that large trials with safeguards against bias are required to clarify the role of ultrasound stimulation in non-union populations [27]. The lack of substantive recent studies investigating the usefulness of ultrasound stimulation for the management of aseptic delayed-unions and non-unions generates skepticism about the effectiveness of the method, bearing in mind the increasing popularity of alternative approaches which offer more predictable results.

Electrostimulation

Electrostimulation does not require removal of the implant that has been used for the fixation of a fracture and has been tried in the management of aseptic non-unions of long bone fractures since the late seventies [28]. Following initial reports, significant research has been carried out about the efficacy of electromagnetic stimulation to promote bone healing in delayed unions and non-unions. Recently, Mollon et al. and Griffin et al. reviewed the relevant published data in order to investigate the evidence regarding the effectiveness of electromagnetic stimulation in the management of non-unions of long bone fractures [29,30]. Both reviews concluded that although the available evidence suggests that electromagnetic field stimulation may offer some benefit in the treatment of aseptic delayed union and non-union of long bone

fractures, it is inconclusive and insufficient to inform current practice and proposed further well-conducted randomised controlled trials.

Dynamisation of the nail

Dynamisation of the nail is the procedure where the surgeon converts the mode of stabilisation of an intramedullary nail from static to dynamic by removing the proximal or distal statically locked screws. In this way, axial forces generated by weight bearing, compress the ununited fracture site and promote bone union [31,32]. Although the technique is minimally invasive and popular between orthopaedic surgeons, there are limited data that support its use. Regarding the management of aseptic femoral non-unions, Wu reported 10 cases of persisting non-union after dynamising 24 nails in ununited femoral fractures while Pihlajamäki et al. experienced four cases of persisting non-union after dynamising seventeen nails in un-united femoral fractures [5,33]. Furthermore, both studies stressed that dynamisation of the nail predisposed to marked shortening of the bone with the highly comminuted or oblique fractures being in higher risk of developing this complication and suggested that dynamization should be preserved for patients without segmental bony defects.

Recently, Litrenta et al. studied 88 patients who underwent dynamisation of the nail for the treatment of aseptic tibial non-union, comparing their results with 91 patients who also suffered an ununited tibial fracture and underwent exchange nailing [34]. They reported 83% and 90% respectively union rates for the two groups and concluded that non-unions of fractures with no cortical contact or with a “gap” or comminution should not be considered

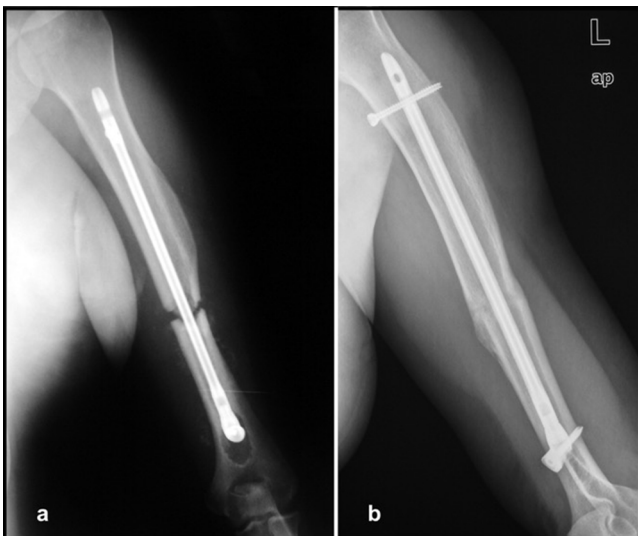


Fig. 1. a. A diaphyseal humeral fracture treated initially with retrograde intramedullary nailing 4 months after fixation (delayed-union stage), just before the percutaneous infusion of concentrated bone marrow. b. Complete bone healing one year later.

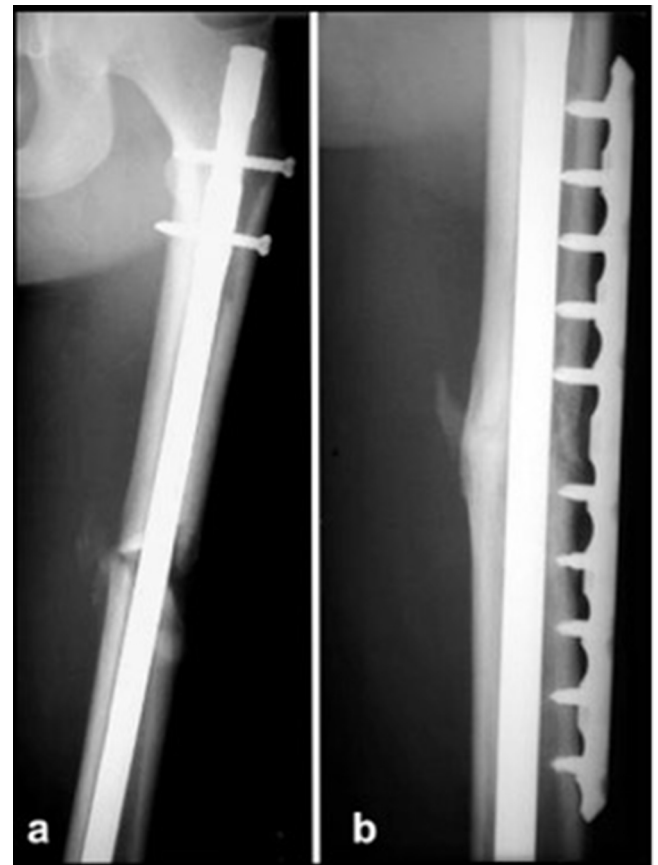


Fig. 2. a. Non-united diaphyseal femoral fracture, 8 months after fixation with static intramedullary nailing. b. Augmentation plating and sound union 10 months later. (Case provided by Prof. P. Megas, University of Patras, Greece).

Download English Version:

<https://daneshyari.com/en/article/5652638>

Download Persian Version:

<https://daneshyari.com/article/5652638>

[Daneshyari.com](https://daneshyari.com)