Clin Orthop Relat Res (2018) 476:2247-2248
DOI 10.1097/CORR.0000000000000491

Clinical Orthopaedics and Related Research®
A Publication of The Association of Bone and Joint Surgeons®

CORR Insights

Published online: 22 September 2018

CORR Insights®: Dual Interlocking Telescopic Rod Provides Effective Tibial Stabilization in Children With Osteogenesis Imperfecta

Thoralf R. Liebs MD, PhD

Where Are We Now?

Osteogenesis imperfecta (OI) is a genetically determined pathology that causes low bone mass and poor bone quality, which typically result in long-bone fractures and skeletal deformities. Caring for patients with OI is challenging on many levels; one is the need to address fractures that occur prior to skeletal maturity.

Although researchers introduced intramedullary rods in the late 1950s to correct deformities and stabilize long-bone fractures for pediatric patients [7], the original rods did not elongate, resulting in reoperations because of bone growth. In 1963, Bailey and Dubow [2] developed a two-component telescopic rod that could elongate using a T-piece that anchored one component in the proximal epiphysis and the other component in the distal epiphysis. This system resulted in a considerable reduction in the number and severity of complications when compared to the non-elongating systems. But complications remained common, many of which were associated with disassembly of the T-pieces [1]. The Sheffield telescopic rod sought to remedy these issues by having fixed T-pieces [8], but unfortunately, that device called for an arthrotomy of the ankle joint and penetration of the T-piece through the articular cartilage of the tibia, an approach that has obvious shortcomings.

Subsequent designs, such as the Fassier-Duval rod (Pega Medical, Laval, Quebec, Canada) with its screw-in mechanism, had the advantage of a single entry-point in the proximal tibia [3]; another, called the single interlocking telescopic rod (S-ITR) [5] used a K-wire for interlocking at the distal epiphysis, and a T-piece is used for proximal fixation. Cho and colleagues approved of the S-ITR, finding that "both the insertion as the removal of the single interlocking telescopic rod was much less invasive than insertion and removal of conventional telescopic rods with a T-piece anchor" [4].

In the current study, Shin and colleagues [6] took this concept further, advancing from the single- to a dual interlocking telescopic rod (D-ITR), by substituting the proximal fixed T-piece with an interlocking pin. The authors found no differences between these two systems in terms of mean surgery-free survival time, mean rod survival time, cessation of elongation, or elongated length. However, the pooled proportions of refractures or complications after the index surgery were higher in the S-ITR group when compared to the D-ITR group. Moreover, there was a higher proportion of patients in the S-ITR group in terms of proximal migration of the sleeve. These results appear promising, showing a possibility for fixation of tibiae in children with OI, with less frequent complications related to sleeve migration of the S-ITR.

This CORR Insights® *is a commentary on the article* "Dual Interlocking Telescopic Rod Provides Effective Tibial Stabilization in Children With Osteogenesis Imperfecta" *by Shin and colleagues available at*: DOI: 10.1097/CORR.0000000000000429.

T. R. Liebs MD, PhD (✉), Inselspital University Hospital, University of Bern, Freiburgstrasse 10, 3010 Bern Switzerland, Email: Liebs@Liebs.eu

T. R. Liebs, Consultant Orthopaedic Surgeon, Inselspital University Hospital, Bern, Switzerland

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Where Do We Need To Go?

Currently, the most-frequently used telescopic rod for this patient group appears to be the Fassier-Duval nail. Therefore, the question arises as to how the D-ITR compares to the Fassier-Duval nail in the tibia. Azzam and colleagues [1] published a series of 58 children with OI who had realignment osteotomies with the Fassier-Duval intramedullary nail, though it was not clear how many of those were used on the tibia. Future research should compare the D-ITR and the Fassier-Duval nail.

There is the potential for epiphyseal damage when using the D-ITR. Surgeons should consider, in terms of epiphyseal damage and/or radiation exposure, the long distance that the interlocking pin must travel within the tibial epiphysis before it reaches the small hole in the rod. Although the authors state that "the procedure is less challenging than it may appear" [6], they also mention that "because of osteopenia of the typical OI epiphysis, the interlocking pin can be manipulated easily during insertion" [6]. Future studies should explore either the various specific design elements of the commercially available rods or the instruments for implanting these rods (such as guiding systems to help ensure correct placement of the interlocking pins), with the goal of mitigating complications.

Finally, we need to refine the indications for each device considering that different rods may be used on different patients depending on the type and location of the fracture or deformities, their age, size, and other parameters that vary widely in patients with OI.

How Do We Get There?

Any direct comparison between the D-ITR and the Fassier-Duval nail (or any other device) should focus on healing and alignment, mid- and long-term patient-reported outcome measures, and the frequency of complications, particularly migration of the components.

While it is easy to call for multicenter randomized controlled trials to compare different fixation methods, given the rarity of the disease, it would be a logistical challenge to initiate such a trial. For this reason, such an approach appears to be somewhat unrealistic.

But researchers can potentially improve upon the current reporting on the frequency of complications for both systems and the parameters for these procedures by developing a standardized "minimal data set" of information. The minimal data set could include age, sex, type of OI, anatomical location, indication (deformity vs. fracture), implant used, and parameters such as date of revision/reoperation and subsequent deformities, which could be used as outcome measures.

I recommend collecting the data in a registry, which would allow interested researchers to compare the performance of different rods. Such a registry could potentially determine the preferred implant for specific indications. Ideally, an international orthopaedic society would run the registry. And because arthroplasty registries have been extremely successful in this regard [4], I believe a properly installed surgical OI registry has the potential to be successful as well. But I am also aware that simply calling for an orthopaedic society to develop a new registry may not lead to any action—so I ask those who are interested in participating in a surgical OI registry to keep the conversation going by either writing a letter to the editor to *CORR*® (EIC@clinorthop.org) or by contacting me directly, as I am willing to push for such an initiative.

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