Comment on Shyam et al.: Leg lengthening by distraction osteogenesis using the Ilizarov apparatus: a novel concept of tibia callus subsidence and its influencing factors

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To the Editor,

We read with interest the article by Shyam et al. entitled “Leg lengthening by distraction osteogenesis using the Ilizarov apparatus: a novel concept of tibia callus subsidence and its influencing factors”, which was recently published in your journal in 2009 [1]. The authors found that all of their callotasis segments had subsidence ranging from 4 mm to 3.2 cm, and 54% of the lengthened segments had significant subsidence of more than 1 cm.

The method used for doing the measurements is described by the authors to be indirect, i.e. by measuring the distance between the nearest Schanz pin on each side of the callotasis zone, respectively, just before removing the Ilizarov frame and at the last check X-ray after removal when the bony pin scars were still visible.

However, based on our personal experience and a thorough evaluation of the method used, there are strong indications that the results of this study are based on significant measuring errors. Unfortunately, Shyam et al. do not describe the applied radiographic technique in detail.

With the Ilizarov ring fixator mounted on the patient's leg, the rings will lie on the surface of the supporting table

during exposure, and the distance between the X-ray film and the tibia is larger than after the removal of the external rings. This will inevitably cause an error in the distance measured on the film or in the PACS system, as long as no calibration with a known distance has been used on each radiograph for comparison of lengths between exposures. Figure 1 in their article indicates that rather large Ilizarov rings were used. To evaluate their method, we used a test set-up, whereby a metal ruler on the same level as the bone was X-rayed in two different situations. First, the distance between the film and the ruler was set at 5.5 cm to simulate the normal distance from the tibial bone to the film. In the second situation we simulated an Ilizarov ring system with an external diameter of 21.4 cm (standard 180 mm Ilizarov ring), with the ruler placed 2.5 cm anteriorly to the centre of the ring. This corresponds approximately to the position of the tibial bone in relation to the centre of the ring in a clinical situation. Thus, the distance from the central axis of the tibia (i.e. the ruler) to the film was about 5.5 cm in the first situation and 13.2 cm in the second.

A standard film focus distance (FFD) of 115 cm was used. This resulted in an enlargement of, respectively, 5.8% and 14.4%, where the largest value was measured on 'the leg' with the Ilizarov apparatus intact. In our set-up the film was placed upon the X-ray table in all measurements. If, by chance, the film is placed on the table while the patient still has the rings mounted and then inside the table at the latest occasion, the error can be as much as 19%, because of the increasing distance between the object and the film. In this situation all lengthenings of about 5 cm or more will be estimated to have a subsidence of at least 1 cm. A mix of these techniques may explain the great variations.

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The extensive subsidence which was described by Shyam et al. is alarming and does not correspond with our clinical experience. However, a thorough analysis of the method as described by Shyam et al. shows that their results might be based on a significant measuring error due to the change of the distance between the tibia and the X-ray film.

References

1. Shyam A, Singh S, Modi H, Song H-R, Lee S-H, An H (2009) Leg lengthening by distraction osteogenesis using the Ilizarov apparatus: a novel concept of tibia callus subsidence and its influencing factors. *Int Orthop* 33:1753–1759