Re: Mono- versus polyaxial locking plates in distal femur fractures: a prospective randomized multicentre clinical trial

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Reply: Dr. Yingze Zhang's letter in response to our manuscript "Mono- versus polyaxial locking plates in distal femur fractures: a prospective randomized multicentre clinical trial" [1] highlights two concerns. First, Dr. Zhang indicates the osteosynthesis, as shown in Fig. 2 of our manuscript [1], might be too rigid due to the number of screws inserted into the proximal part of the fracture site. Second, the term complex distal femoral fractures needs clarification. The first answer to Dr. Zhang's letter is that indeed rigidity needs to be taken into account when performing internal fixation. The mechanical concept of locking plate fixation includes relative stability thereby allowing for indirect fracture healing [2]. Using the new techniques of biological osteosynthesis like indirect reduction and minimal invasive approaches, e.g. submuscular implant insertion, the plate length can be chosen according to the mechanical demands of the fracture. The ideal osteosynthesis minimizes plate loading and screw loading in order to avoid fatigue fractures due to cyclic loading [3]. The following key figures have been identified to classify the optimal osteosynthesis [4], namely, plate span width (quotient plate length and overall fracture length) and plate screw density. Empirical data suggests optimal values of 2 to 3 for the plate span width in cases of comminuted fractures, and the plate screw density should be at about 0.5 [3]. In the osteosynthesis presented in Fig. 2 of our manuscript, the plate span width has been calculated with 2.45 (see calculation Fig. 1). Due to the comminution of the fracture, screws have been inserted into the fracture zone (B), and the plate screw density for the fracture zone is 0.33. The low plate screw density in the fracture zone is in line with the minimal touch technique allowing for undisturbed fracture healing following

indirect reduction. The calculation of the overall plate screw density of the plate is obsolete in this case, as the distal femur fracture as shown demands the use of the metaphyseal plate. The local anatomy has to be taken into account, whereby the primary goal is a balanced fixation with anchorage in the metaphysis and the diaphysis. Taken together, flexibility of

Fig. 1 NCB plate osteosynthesis in a 41-year-old patient; radiologic follow-up at three months. Anteroposterior (AP) view taken from Fig. 2c of [1]. The plate span width (quotient plate length [A] and overall fracture length [B]) has been calculated with 2.45. The plate screw density for the fracture zone (b) is 0.33. Diaphyseal anchorage (a) and metaphyseal anchorage (b) is depicted

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this internal fixation is given where needed, as determined by the low plate screw density in the fracture zone. In this case the surgeon decided to guarantee strong anchorage in the diaphysis using nine screws and in the metaphysis using five screws.

Regarding the second question of Dr. Zhang, ‘complex distal femoral fracture’ is indeed not defined in the literature. The degree of complexity is in most cases dependent on the AO classification. Type C fractures, involving the articular surface, are commonly more complex. Challenges of the treatment of type C fractures usually involve the reconstruction of the articular surface. We do not agree though in stating complex distal femoral fractures are always type C fractures. Type A and type B fractures can be complex as well. Dependent on the grade of comminution, fracture treatment is challenging in terms of reconstruction of length, axis and rotation/torsion. To the experienced surgeon, especially the 31-A3 fracture appears substantially instable due to muscle tension of the strong

flexor muscles pulling the knee into flexion. Hence, these fractures are considered also as ‘complex’.

References

1. Hanschen M, Aschenbrenner IM, Fehske K, Kirchhoff S, Keil L, Holzapfel BM, Winkler S, Fuechtmeier B, Neugebauer R, Luehrs S, Liener U, Biberthaler P (2014) Mono- versus polyaxial locking plates in distal femur fractures: a prospective randomized multicentre clinical trial. *Int Orthop* 38:857–863
2. Hanschen M, Biberthaler P (2013) Mono- versus polyaxial locking plates. *Unfallchirurg* 116:733–741
3. Gautier E, Sommer C (2003) Guidelines for the clinical application of the LCP. *Injury* 34(Suppl 2):B63–76.:B63–B76
4. Rozbruch SR, Muller U, Gautier E, Ganz R (1998) The evolution of femoral shaft plating technique. *Clin Orthop Relat Res* 354:195–208