Letter to the Editor
Percutaneous autologous bone marrow injections for delayed or non-union of bones

To the Editor:
We read with great interest the article by Singh et al.1 Could the authors please clarify:

1. What was the rationale for this study when the role of marrow injection in impaired fracture healing is well-documented?2-4
2. Exclusion and inclusion criteria were not defined. The authors stated that “there was no open fracture or infected non-union.” Was this a coincidence or did the authors exclude them? Furthermore, was informed consent from patients and approval from an ethics committee obtained?
3. We disagree with the statement “Platelet-rich plasma can be administered percutaneously, but centrifugation is needed and its osteogenic potential has not been established in human models, despite varied success rates in animal models.” Platelet-rich plasma has been reported as a safe and effective therapy for treatment of persistent non-union in human models.5-7
4. The authors advocated that “Two bone marrow injections were given for children and adolescents, and 3 for adults”. Were there any criteria to decide when to proceed for next dose?
5. The authors stated that “mobility was not restricted” following the procedure. Yet to avoid mechanical disruption of the process of tissue regeneration and bone healing, immobilisation is crucial either with fixation or in plaster cast, and weight bearing should be delayed until the callus is radiographically evident.8 In this context, how do the authors justify their statement?
6. The authors advocated the use of marrow injection for treating delayed or non-union of bones. Can the procedure be used for unstable fractures with impaired healing or for those with pre-existing angular deformity or shortening? Are there any contraindications to marrow injection pertaining to fracture configuration?

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REFERENCES
Authors’ reply
Our responses to the queries raised are as follows:

1. Our rationale for this study was to emphasise the effectiveness of bone marrow injection for delayed/non-unions, prior to considering bone grafting. We showed that bone marrow injection worked for almost all long bones, including metacarpals. Three injections of low volume (~30 ml) were as effective as a large volume (100–150 ml) of one-off injection,1,2 and it does not dilute the concentration of osteoblasts.

2. Fracture non-unions of stable configurations were included. No or minimal mobility at the site of non-union was expected. Fractures that were very unstable or with angular deformity and shortening were excluded, as were open fractures and infected non-unions. Informed consent was obtained from each patient.

3. We were aware of the paper by Galasso et al.3 on platelet-rich plasma and the paper by Hakimi et al.4 about the supplementary role of platelet-rich plasma with bone grafting for treatment of non-unions. The paper of Griffin et al.5 was not available at the time of acceptance of our paper. Despite that, studies on the use of platelet-rich plasma alone for treatment of non-unions remain limited.

4. Patients were followed up (at 4–6 weeks interval) radiographically and clinically to decide on the need to proceed to the 2nd and 3rd injections.

5. These were cases of atrophic non-union, where biology rather than mechanical instability at the fracture site was the reason for failed union. Hence, immobilising the fracture site (other than for comfort) was deemed unnecessary. Therefore, patients were allowed to mobilise as comfort allowed.

6. In our experience, bone marrow injections work well in atrophic non-unions where fracture biology was the reason for failed union. Hence, for unstable or hypertrophic non-unions they may not have any role. Fractures that are very unstable or with angular deformity and shortening constitute contraindications to this procedure.

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