Answer to the letter to the editor of H. Koller et al. concerning: “A systematic review of the management of hangman’s fractures” by Xin-Feng Li et al. (2006) Eur Spine J 15:257–269

**Xin-Feng Li · Li-Yang Dai · Hua Lu ·
Xiao-Dong Chen**

Published online: 14 July 2006
© Springer-Verlag 2006

We thank Dr. Koller for his letter regarding the issue of the management of hangman’s fractures.

As to language and publication bias, there are a considerable number of the systematic reviews involving the literature only reported in English among the evidence-based studies. These researchers predetermined that the studies in languages other than English should be excluded at the beginning of the literature searching. Although some authors acknowledged that this process may exclude negative studies and produce a review with overly sanguine conclusions [14], the role of language restrictions compared with language inclusions remains uncertain and there is no evidence that language restricted systematic review could lead to biased estimates of intervention effectiveness [10, 11]. More recently, the study of Pham et al. [17] also pointed out that language restriction would not alter the results of conventional medicine systematic reviews. Therefore, excluding trials published in languages other than English has generally little effect on summary treatment effect estimates. We restricted language because of time consuming and costly attempts to identify all relevant literature and the translation of foreign language articles. Whether there is difference of quality between published and unpublished (or delayed) papers remains controversial [3, 5], we believe that, however, excluding unpublished

work does not influence the evidence determination of the management of hangman’s fractures in our review.

We agree with Dr. Koller that a classification system should describe the true pathologic process, because a good classification system should help us to identify injury patterns, assess prognoses, and guide treatment decisions. However, it is difficult to measure the validity of orthopaedic classifications. High correlation between the preoperative radiographs and the intraoperative findings is necessary for the validation of a classification system. Nevertheless, independent confirmation of the intraoperative assessment is always impossible in practice, which affects the validity of so many commonly used orthopaedic classification systems based on radiographic findings [7]. Although it’s true that the classifications (Effendi/Levine) do not include some unusual types of hangman’s fractures, these have been used in most literature for dealing with hangman’s fractures.

Today, the publications of systematic reviews of the orthopaedic literature, which often include statistical pooling or meta-analysis, are becoming more common. A final rationale for systematic reviews is accuracy, or at least an improved reflection of reality [15]. More and more clinicians have been aware that useful evidence from the biomedical literature should be an integral component of clinical decision-making. However, systematic review of clinical trials is not a universally reliable tool, the inclusion of an unbiased sample of relevant studies is definitely essential to the validity of systematic reviews and meta-analyses. Evidence-based medicine can aid, but can never replace, reasonable clinical reasoning. Clinicians should draw an inference about individual patients from the basis of analogy, experience, and theory as well as research evidence

The letter to which this author’s reply refers can be found at <http://dx.doi.org/10.1007/s00586-006-0174-0>

X.-F. Li · L.-Y. Dai (✉) · H. Lu · X.-D. Chen
Department of Orthopedic Surgery, Xinhua Hospital,
Shanghai Jiaotong University School of Medicine,
1665 Kongjiang Road, 200092 Shanghai, China
e-mail: lydai@etang.com

[16, 18]. Evidence from the biomedical literature analysis can lead to bad practice if it is applied in an uncritical or unfeeling way [16]. The complex clinical decision-making demands an appreciation of the ways in which knowledge, skills, values, and research evidence are integrated in each patient–clinician encounter, such as the judgment of the stability and selection of the operative approach for hangman's fractures. Just as shown above, practical techniques for incorporating information from systematic reviews into clinical decision-making should be created and disseminated.

In a systematic review of a set of trials, an important issue is whether heterogeneity of treatment effect exists between clinical trials. Pooling estimates from a series of studies without considering heterogeneity can result in a misleading conclusion. Therefore, we should determine whether the clinical trials could reasonably be reported as sharing a common treatment effect before combining them statistically. It is necessary to apply a common classification for treatment evaluation. The exclusion criteria we used tend to be few and limit the sample of studies to increase the homogeneity and maintain the focus of the management of hangman's fractures. Heterogeneity usually arising from differences between study populations, detailed surgical interventions, or reported results, which were often reported only in a qualitative manner by reviewers for the limitation of the quality of relevant information reported in primary studies. The lack of standardization for reporting treatment outcomes and complications in the orthopaedic literature is a common problem [9]. Maybe for this reason, the functional outcome after conservative or operative treatment, such as pain, range of motion, etc., was not documented in most of the literature on the management of hangman's fractures. And the above factors limited the discussion on the drawbacks of conservative and operative treatments at the same time. This is indeed an important aspect that we should improve in the literature report in the future.

The shortages of orthopaedic systematic reviews may arise from an overall scarcity of randomized controlled trials in the published literature on orthopaedic interventions [11]. Although the usefulness of results from nonrandomized studies is still controversial for the consequences of residual confounding, nonrandomized studies may be helpful to bring about hypotheses, plan methodologically stronger clinical studies if they are feasible, and justify proposals for funding of such studies [8]. More recently, Audige et al. [1] acclaimed that the evidence from well-done nonrandomized studies, such as good-quality cohort

studies, is likely to be better than evidence only based on the surgeons' experience. We propose that researchers and journal editors should work together to promote more consistent quality parameters for describing specific nonrandomized designs. And efficient search strategies for locating such studies need to be developed and tested in the future.

We agree with Koller et al. that C0-2 and C1-3 stabilizations would lead to overtreatment because these procedures might eliminate motion of C1-2. Judet's technique facilitates an exact reconstruction of anatomical conditions. However, we do not know whether this technique alone would achieve desirable results in patients with an injured C2/C3 disc. Unfortunately, most papers in our review did not address this issue. We believe that this technique is not indicated in patients with a traumatic disk herniation compromising the spinal cord. In this situation, we advocated an anterior C2-3 discectomy and fusion with plating.

As our review article focused on the indications of nonoperative treatment, the advantages and drawbacks of any conservative modalities were not discussed. There is an increasing consensus that healing in a malunion position with anterior displacement was common and it may be not harmful [2, 6, 10]. Although the study by Tuite et al. [19] showed that plenty patients with spontaneous C2-3 fusion in subluxated position complained about pain, it cannot be concluded that healing in an abnormal position would lead to pain. We agree that the assessment of stability of C2-3 using dynamic X-rays or MRI may provide valuable assistance to decision making in the treatment of hangman's fractures, but most of the papers included in this systemic review did not supply the information of these examinations. It is true that anterior C2-3 fusion for unstable hangman's fractures may yield satisfactory functional and radiological results with highest fusion rates [7], but halo immobilization after traction reduction of Type II and IIA hangman's fractures remains an effective method of management [20]. In addition, the use of nonrigid immobilization for hangman's fractures has been reported successful [4, 6], thus possibly making halo vests and other rigid immobilization is less necessary.

The conclusions drawn from our systemic review may be unavoidably limited because they are mainly based upon the original references of low quality and heterogeneity. However, we insist upon the opinion that the management of the hangman's fractures should be achieved predominantly by nonoperative means and any operative method should be compared with the natural history of fractures and nonoperative

treatment in terms of functional outcomes. As for hangman's fractures with C2-3 disc or discoligamentous disruption, it is unclear whether this injury is irreversible and will eventually lead to late instability and subsequent neurological deficit. Therefore, there is a need for randomized controlled trials to prove the priority of the anterior fusion C2-3 in managing these injuries. In addition, surgical intervention might incur the risk of certain potential complications. In conclusion, anterior C2-3 fusion is indicated unusually for hangman's fractures.

References

1. Audige L, Bhandari M, Griffin D, Middleton P, Reeves BC (2004) Systematic reviews of nonrandomized clinical studies in the orthopaedic literature. *Clin Orthop* 427:249–257
2. Choi WG, Vishteh AG, Baskin JJ, Marciano FF, Dickman CA (1997) Completely dislocated hangman's fracture with a locked C2-3 facet: case report. *J Neurosurg* 87:757–760
3. Cook DJ, Guyatt GH, Ryan G, Clifton J, Buckingham L, Willan A, McIlroy W, Oxman AD (1993) Should unpublished data be included in meta-analyses? Current convictions and controversies. *JAMA* 269:2749–2753
4. Coric D, Wilson JA, Kelly DL Jr (1996) Treatment of traumatic spondylolisthesis of the axis with nonrigid immobilization: a review of 64 cases. *J Neurosurg* 85:550–554
5. Egger M, Dickersin K, Davey Smith G (2001) Problems and limitations in conducting systematic reviews. In: Egger M, Davey Smith G, Altman D (eds) *Systematic reviews in health care meta-analyses in context*. BMJ Publishing Group, London, pp 43–68
6. Francis WR, Fielding JW, Hawkins RJ, Pepin J, Hensinger R (1981) Traumatic spondylolisthesis of the axis. *J Bone Joint Surg Br* 63:313–318
7. Garbuz DS, Masri BA, Esdaile J, Duncan CP (2002) Classification systems in orthopaedics. *J Am Acad Orthop Surg* 10:290–297
8. Hartz A, Benson K, Glaser J, Bentler S, Bhandari M (2003) Assessing observational studies of spinal fusion and chemo-nucleolysis. *Spine* 28:2268–2275
9. Johnner R, Wruhs O (1983) Classification of tibial shaft fractures and correlation with results after rigid internal fixation. *Clin Orthop* 178:7–25
10. Levine AM, Edwards CC (1985) The management of traumatic spondylolisthesis of the axis. *J Bone Joint Surg Am* 67:217–226
11. Misra A, Kapur R, Maffulli N (2001) Complex proximal humeral fractures in adults: a systematic review of management. *Injury* 32:363–372
12. Moher D, Pham B, Klassen TP, Schulz KF, Berlin JA, Jadad AR, Liberati A (2000) What contributions do languages other than English make on the results of meta-analyses? *J Clin Epidemiol* 53:964–972
13. Moher D, Pham B, Lawson ML, Klassen TP (2003) The inclusion of reports of randomised trials published in languages other than English in systematic reviews. *Health Technol Assess* 7:1–90
14. Montori VM, Swiontkowski MF, Cook DJ (2003) Methodologic issues in systematic reviews and meta-analyses. *Clin Orthop* 413:43–54
15. Mulrow CD (1994) Rationale for systematic reviews. *BMJ* 309:597–599
16. Naylor CD (1995) Grey zones of clinical practice: some limits to evidence-based medicine. *Lancet* 345:840–842
17. Pham B, Klassen TP, Lawson ML, Moher D (2005) Language of publication restrictions in systematic reviews gave different results depending on whether the intervention was conventional or complementary. *J Clin Epidemiol* 58:769–776
18. Tanenbaum SJ (1993) What physicians know. *N Engl J Med* 329:1268–1271
19. Tuite GF, Papadopoulos SM, Sonntag VK (1992) Caspar plate fixation for the treatment of complex hangman's fractures. *Neurosurgery* 30:761–765
20. Vaccaro AR, Madigan L, Bauerle WB, Blescia A, Cotler JM (2002) Early halo immobilization of displaced traumatic spondylolisthesis of the axis. *Spine* 27:2229–2233