Author's response to reviews

Title: Lateral insertion is a good prognostic factor after in situ fixation in slipped capital femoral epiphysis

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Version: 2 Date: 9 August 2014

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Object: MS: 1750280287125453 - Lateral insertion is a good prognostic factor after in situ fixation in slipped capital femoral epiphysis. Dr Shigeo Hagiwara et al.

Thank you for consideration of our manuscript for publication in your journal. We have reviewed the above manuscript according to your reviewer’s comments.

Reviewer #1 (Dr Aik Saw)
MINOR COMMENT
The study was designed to evaluate various technical variables of the treatment and outcome was based on degree of radiological migration. It would be correct to come to the conclusion if the conditions are homogenous (all the femurs are equally stable). I do not think we can assume that the “degree of displacement” is not associated with “inherent stability” of the condition. In the sample population, the posterior tilting angle (PTA) varies from 18 to 75 degrees. I think that many surgeons will tend to use medial entry for more severe cases, and lateral entry for less severe cases. The two groups will not be comparable in terms of inherent stability from the beginning.

- We added Table 1 for comparison of slip-retention group (five degrees or less) and slip-progression group (more than five degrees). Both PTA at ISF and at physeal closure were not significantly different between the slip-retention group and the slip-progression group. Progression of PTA was naturally significantly larger in the slip-progression group than in the slip-retention group (6.9 degrees versus 0.9 degrees, \( p=0.001 \)). Rate of lateral insertion was significantly higher in the slip-retention group than in the slip-progression group (\( p=0.011 \)). Acute on chronic type of SCFE was more in the slip-retention group than in the slip-progression group with a statistical difference (\( p=0.043 \)). We also added Table 2 for comparison of lateral insertion group and medial insertion group. PTA at ISF was significantly larger in the medial group than in the lateral group (37.7 degrees versus 29.6 degrees, \( p = 0.004 \)). PTA at physeal closure was also significantly larger in the medial group
than in the lateral group (41.6 degrees versus 30.8 degrees, p = 0.001). Consequently, progression of PTA was 3.9 degrees for the medial group and 1.2 degrees for the lateral group with a statistical difference (p = 0.001, Figure 4).

We must admit it was a limitation to this retrospective study that patient characteristics varied, and each operation was performed according to the surgeon’s preference and best judgment. A prospective comparative trial is desirable to validate our results.

Reviewer #2 (Dr Yasuharu Nakashima)

Major Compulsory Revisions

1. One of the significant findings of this manuscript was that the screw insertion medial to intertrochanteric line was an only significant factor for the slip progression. But the results of statistical analysis was just briefly described in the last paragraph of Result section. This reviewer recommends the more detailed description. The authors should present the data of univariate analysis between the groups with and without the further slip and then show the results of multivariate analysis. Both should be appeared in Tables.

- We added Table 1 for comparison of slip-retention group (five degrees or less) and slip-progression group (more than five degrees). Both PTA at ISF and at physeal closure were not significantly different between the slip-retention group and the slip-progression group. Progression of PTA was naturally significantly larger in the slip-progression group than in the slip-retention group (6.9 degrees versus 0.9 degrees, p=0.001). Rate of lateral insertion was significantly higher in the slip-retention group than in the slip-progression group (p=0.011). Acute on chronic type of SCFE was more in the slip-retention group than in the slip-progression group with a statistical difference (p=0.043).

2. The severer slip usually needs more medial (or anterior) point of the screw insertion to stabilize the slipped epiphysis. From this point, this reviewer speculate the more PTA, as one of the deteriorating factors, resulting the more slip progression. Please clarify it.
We added Table 2 for comparison of lateral insertion group and medial insertion group. PTA at ISF was significantly larger in the medial group than in the lateral group (37.7 degrees versus 29.6 degrees, p = 0.004). PTA at physeal closure was also significantly larger in the medial group than in the lateral group (41.6 degrees versus 30.8 degrees, p = 0.001). Consequently, progression of PTA was 3.9 degrees for the medial group and 1.2 degrees for the lateral group with a statistical difference (p = 0.001, Figure 4).

We must admit it was a limitation to this retrospective study that patient characteristics varied, and each operation was performed according to the surgeon’s preference and best judgment. A prospective comparative trial is desirable to validate our results.

3. This study mixed the stable and unstable slip with single and double screws, leading to the difficulty of interpretation of the presented results. This reviewer recommends focusing on the case with stable slip and single screw fixation. That makes the point clearer.

With the reviewer’s helpful advice, we excluded 6 hips with double screws to analyze only single screw ISF. We kept five unstable hips to require a minimum quantity for statistical analysis.

Reviewer #3 (Dr Neil Wilson)

Major Compulsory Revisions

1. A 'flow chart' of the initial number of hips and patients and steps or exclusions that led to the final numbers being analyzed would go a long way to clarifying this. Initially its seems 112 hips / 98 patients were registered. Although the reasons for exclusion are described the numbers given seem to apply to a smaller number 77 hips / 64 patients. To answer the aim of the study to clarify the incidence of progression is unclear if the denominator is not obvious.

The authors could clarify how they have dealt with bilateral cases. For example, see Park MS, Kim SJ, Chung CY, Choi IH, Lee SH, Lee KM. Statistical consideration for bilateral cases in orthopaedic research. The Journal of bone and joint surgery American volume. 2010
We registered 112 hips in 98 SCFE patients from 1996 to 2010. ISF was performed on 77 hips in 64 SCFE patients (13 bilateral case). We excluded four hips in four patients with avascular necrosis, six hips in three patients (3 bilateral cases) with endocrine disorders, six hips in six patients with double screw fixation, and six hips with preventive fixation for asymptomatic contralateral hip (6 bilateral cases). Two hips in two patients were not followed-up until physeal closure. As a result, 53 hips in 49 patients (4 bilateral cases) were analyzed in this study. Joint- based analysis was applied in this study. We added above details in the Methods section.

2. For me tabulation of the results would clarify the information the authors wish to convey. This would be better rather than relying on descriptive text alone.

Of interest would be a clearer comparison of the characteristics of the group of cases with a lateral insertion point versus those with a medial insertion point. The comparability of these two groups is particular relevant to the conclusions the authors draw I think. Of interest would be the comparison, between the two groups, of the initial degree of slip and also the final position of the screw achieved. I am currently unclear if the observation that lateral insertion points being seemingly better than medial insertion may not be due to some other difference between the groups. For example did cases with a greater degree of slip have more medial entry points or less effective final screw position in the head? Is the observed progression as an association representative of the more severe cases rather than screw entry point selection?

We added Table 2 for comparison of lateral insertion group and medial insertion group. PTA at ISF was significantly larger in the medial group than in the lateral group (37.7 degrees versus 29.6 degrees, p = 0.004). PTA at physeal closure was also significantly larger in the medial group than in the lateral group (41.6 degrees versus 30.8 degrees, p = 0.001). Consequently, progression of PTA was 3.9 degrees for the medial group and 1.2 degrees for the lateral group with a statistical difference (p = 0.001, Figure 4).

We must admit it was a limitation to this retrospective study that patient characteristics varied, and each operation was performed according to the surgeon’s preference and best judgment. A prospective comparative trial is desirable to validate
our results.

3. In the methods the protocol suggests that cases of unstable SCFE would be fixed by two screws, yet in the results the authors explain that whilst 10 cases were identified as unstable there appear to be only six cases with double screws. Do we presume that the remaining 4 unstable SCFE cases were treated with single screw fixation? Did these cases demonstrate progression of PTA?

- Basically in unstable SCFE, two cannulated screws had been fixed to gain sufficient stabilization. However, each operation was performed according to the surgeon’s preference and best judgment. Thus, some unstable SCFE cases seemed to be treated with single screw fixation. We excluded 6 hips with double screws to analyze only single screw ISF. We kept five unstable hips to require a minimum quantity for statistical analysis.

Minor Essential Revisions

1. The recommendation that the lateral insertion is preferable since it appears to be more effective would seem valid but to state that it is safe may be better omitted. Larger numbers are usually needed to clarify safety when considering the likelihood of the occurrence of some event that has not been observed; since 31 hips were considered to have lateral points of insertion statements of safety are problematic see references on Hnley's Rule of three: Eypasch E, Lefering R, Kum CK, Troidl H. Probability of adverse events that have not yet occurred: a statistical reminder. BMJ. 1995 Sep;311(7005):619-620. http://www.ncbi.nlm.nih.gov/pubmed/7663258 and Hanley JA, Lippman-Hand A. If nothing goes wrong, is everything all right? Interpreting zero numerators. JAMA : the journal of the American Medical Association. 1983 Apr;249(13):1743-1745. http://www.ncbi.nlm.nih.gov/pubmed/6827763

- With the reviewer’s helpful advice, the word “safe” was deleted.

2. How much progression of PTA is considered of clinical significance? The range of values seems quite wide. Are they employing over five degrees of progression as relevant clinically, that level being identified in the conclusion.
• As in the Statistical analysis in the Methods section, slip progression was defined as a change of more than five degrees of PTA based on Rao et al. (Rao SB, Crawford AH, Burger RR, Roy DR: Open bone peg epiphysiodesis for slipped capital femoral epiphysis. J Pediatr Orthop. 1996, 16:37-48.)

3. I am unclear when the authors refer to the patient characteristics previously reported as risk factors and include endocrinology disorders but which they did not confirm as significant factors; yet I understood that the authors had excluded endocrine cases in their study.

• Patients with avascular necrosis, endocrine disorders, multiple screw fixation, and preventive fixation for asymptomatic contralateral hip were excluded. Other patient characteristics such as the growth spurt, endocrinologic disorders, unstable slip, or acute-on-chronic slip were not found to be significant factors in this study.