**Author’s response to reviews**

**Title:** Fate of stable hips after prophylactic femoral varization osteotomy in patients with cerebral palsy

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Reviewer reports:

Kishore Mulpuri (Reviewer 1): Great paper.

Please only include patients with minimum 4 year follow up. That is required to assess properly the complication, re operation and re dislocation rate.

We appreciate your comment. As suggested, we have added the following sentences in the Result section.

“The complications after surgery included supracondylar fracture of the distal femur in 1 patient and subtrochanteric fracture after implant removal in 1 patient. In addition, 5 hips (2.23%) were re-dislocated (1 in stable hip and 4 in displaced hip), of which, 4 were re-operated.” (Result section, line 48, page 10)

We included the patients with a minimum of 1 year of follow-up and some had short follow-ups. In addition, the follow-up intervals varied owing to retrospective nature of this study. In practice, longitudinal data in a retrospective study are often highly unbalanced in the sense that an equal number of measurements is not available for all subjects and/or that measurements are not taken at fixed time points. Therefore, we used an LMM to overcome these issues, and focused on annual changes of the radiographic parameters and the factors that could influence these annual
changes. An LMM is useful to analyze even a slight change in the data set of this study, which is longitudinal and where repeated measurements are obtained over time for each subject. Our results using an LMM suggested a trend of change in measurements on the hip radiographs of the CP patients. We believe that these findings can inform physicians of the prognosis of hip reconstructive surgery in CP patients and that including these patients in our study is reasonable.

We included this issue in the Limitation section as follows:

“Thirds, this was a retrospective study; therefore, some patients had short follow-ups and the follow-up intervals varied. We used an LMM to overcome the unbalanced structure of our data set and focused on annual changes of the radiographic parameters and the factors that could influence these annual changes. Our results using an LMM suggested a trend of change in measurements on the hip radiographs of the CP patients. We believe that these findings can inform physicians of the prognosis of hip reconstructive surgery in CP patients and that including these patients in our study is reasonable.” (Discussion section 23, line, page 12)

Woo Young Jang (Reviewer 2): This study investigated the outcomes after FVO in stable hips with CP. The authors reported that prophylactic FVO in the stable hip of patients with CP showed good surgical outcomes, without a risk of hip displacement throughout the follow-up duration.

Main concern:

1. In the conclusion, the authors reported that the stable hip did not show risk of hip displacement during follow up, but the p-value of the follow-up duration in the linear mixed model presented in Table 3 shows possible marginal significance (p=0.057). This requires a description of whether there may be a possible significant association between migration percentage and follow-up duration in the stable hip, possibly with longer follow up duration or with a greater sample size of the stable hip group.

As in your comment, although the p-value of the follow-up duration in Table 3 did not reach the significance level of 0.05, it was possibly of marginal significance (p=0.057). Thus, a significant association between MP and follow-up duration is possible owing to the longer follow-up duration in the stable hip group (3.6 years) than in the displaced hip group (3.0 years). However, the annual increase in MP was only 0.5% in the stable hip group after prophylactic FVO, and its clinical impact was minimal.

We included this issue in the Limitation section as follow:

“Fourth, although the p-value of the annual change in MP according to the follow-up duration did not reach the significance level of 0.05, it was possibly of marginal significance (p=0.057). Thus, a significant association between MP and follow-up duration is possible owing to the longer follow-up duration in the stable hip group (3.6 years) than in the displaced hip group (3.0 years).
years). However, the annual increase in MP was only 0.5% in the stable hip group after prophylactic FVO, and its clinical impact was minimal.” (Discussion section 40, line, page 12)

2. In addition, in Table 2, the immediate postoperative migration percentage in the stable hip group showed an average increase of 11.5% in the final follow-up. This is not different from the 11% seen in the displaced group. Further explanation is needed.

As you mentioned, the average increases in MP in the stable hip group at the final follow-up was not different from that in the displaced hip group. However, the follow-up intervals and follow-up duration varied owing to the retrospective nature of this study. The follow-up duration in the stable hip group (3.6 years) was longer than that in the displaced hip group (3.0 years). In practice, longitudinal data in a retrospective study are often highly unbalanced in that an equal number of measurements is not available for all subjects and/or that measurements are not taken at fixed time points. Therefore, we used an LMM to overcome these issues and focused on annual changes of the radiographic parameters and the factors that could influence these annual changes. An LMM is useful to analyze even a slight change in the data set of this study, which is longitudinal and where repeated measurements are obtained over time for each subject. Our results using an LMM showed that MP in the displaced hip after hip reconstructive surgery was increased by 1.6% per year (p<0.001) and MP in the stable hip after prophylactic FVO was increased by 0.5% per year (0=0.057).

We have included this issue in the Limitation section as follows:

“Thirds, this was a retrospective study; therefore, some patients had short follow-ups and the follow-up intervals varied. We used an LMM to overcome the unbalanced structure of our data set and focused on annual changes of the radiographic parameters and the factors that could influence these annual changes. Our results using an LMM suggested a trend of change in measurements on the hip radiographs of the CP patients. We believe that these findings can inform physicians of the prognosis of hip reconstructive surgery in CP patients and that including these patients in our study is reasonable.” (Discussion section, line 23, page 12)

Specific reviews.

1. Line 60-63: 'Another recent study', seems to refer to the current authors' study. The word "another" needs to be revised to "our" in order to give an objective point of view for readers.

As suggested, we changed the word “another” to “our” as follows:

“Our recent study using a decision analysis model demonstrated that concurrent prophylactic FVO for the contralateral stable hip in individuals with CP undergoing hip reconstructive surgery
was better than closed observation from a medical perspective.” (Background section 34, line, page 4)

2. Line 63-65: It is necessary to clarify the sentence “recently, concurrent prophylactic FVO for stable hips has been performed in patients with CP undergoing hip reconstructive surgery for the contralateral displaced hip”. Is this practice the norm for the authors or is there a reference that shows that this practice is being performed regularly by others? If other authors are advocating this practice, a reference should be given.

We meant that our institution has been performing concurrent prophylactic FVO for stable hips. Therefore, we have revised the sentence as follows:

“Therefore, our institution has been performing concurrent prophylactic FVO for stable hips in patients with CP who had undergoing hip reconstructive surgery for the contralateral displaced hip.” (Background section, line 41, page 4)

3. Line 94-97: Why did the authors release gracilis, semitendinosus and semimembranosus tendons that are mainly related to knee motion, when there was insufficient hip abduction?

We released other hip abductors including adductor brevis, gracilis, and pectineus if there was insufficient hip abduction after release of adductor longus. Therefore, we changed the sentence “All patients underwent medial soft tissue release of the adductor longus tendon; if the abduction angle obtained was not >30°, additional soft-tissue release, including of the adductor brevis, gracilis, and semitendinosus or semimembranosus, was performed” to “All patients underwent medial soft tissue release of the adductor longus tendon; if the abduction angle obtained was not >30°, additional soft-tissue release, including of the adductor brevis, gracilis, and pectineus, was performed” (Method section, line 3, page 6)

4. Line 101-104. Since FVO itself is a kind of open reduction, please clarify what kind of open reduction was additionally performed.

After FVO, if concentric reduction was not achieved on intraoperative fluoroscopic examination, we performed open reduction of the hip joint including capsulorrhaphy, removal of the ligamentum teres and pulvinar, and resection of the transverse acetabular ligament. Therefore, we have revised the text as follows:

“After FVO, if concentric reduction was not achieved on intraoperative fluoroscopic examination, open reduction of the hip joint including capsulorrhaphy, removal of the ligamentum teres and pulvinar, and resection of the transverse acetabular ligament was additionally performed.” (Method section, line 23, page 6)
5. Line 195-196: The authors described that FVO surgery was performed in 80 stable hips among 119 patients. What is the criteria of prophylactic FVO?

We routinely performed prophylactic FVO in the stable hip. Among 119 patients, 94 had unilateral hip displacement, which indicated the 94 hips were stable. Among the 94 stable hips, 80 were subjected to prophylactic FVO because the parents of 14 patients refused the prophylactic FVO.

We have revised the sentence “Prophylactic FVO in the stable hip was performed in 80 hips, and hip reconstructive surgery in the displaced hip was performed in 144 hips.” to “Among the 94 stable hips, prophylactic FVO was performed in 80 hips because the parents of 14 patients refused prophylactic FVO. Hip reconstructive surgery for the displaced hip was performed in 144 hips.” (Result section, line 28, page 10)

6. Line 201: Please clarify the abbreviation 'SDR'?

As suggested, we have changed the abbreviation “SDR” to selective dorsal rhizotomy. (Result section, line 45, page 10)

7. Line 234-250 It is necessary to discuss how the literature content described in these two paragraphs relate to the findings of the current study. Please elaborate on the importance of the findings of this paper in relation to the references discussed in these two paragraphs.

As suggested, we have revised the Discussion section as follows:

“The present study showed that there was no recurrence of hip displacement after prophylactic FVO. Therefore, we think that concurrent prophylactic FVO in the contralateral stable hip could be considered at the time of hip reconstructive surgery of the displaced hip to prevent progressive displacement of the stable hip.” (Discussion section, line 43, page 13)

8. Line 284-287: Please give a reference for the sentence "While a positive relationship between acetabular dysplasia and MP has been reported…".

As suggested, we have added the following reference:


(Reference section, line 8, page 22)