follow-up time, pre-operative GDI and normalized gait velocity (gait velocity/lower limb length) at results.

Results: The age at baseline, gender distribution and follow-up time (more than 30 months) were similar between groups. There was a prevalence of GMFCS II in Control Group and GMFCS III in SEMLS Group. Regarding the surgical procedures performed, we observed a prevalence of knee and foot interventions. The GDI reduced from 59.52 to 57.86 in Control Group and increased from 51.29 to 58.38 in SEMLS Group (p<0.001). Moreover, a decrease in GPS (improvement) occurred only in the SEMLS Group (−2.499), as well (p<0.001). In SEMLS Group, patients with improvement at GDI higher than 10 points had mean pre-operative GDI of 46.15 whereas others groups exhibited GDI before intervention from 51.72 to 55.99 (p<0.001). In addition to this, patients with reduction of GDI after intervention had pre-operative normalized gait velocity lower than subjects that showed an improvement at GDI higher than 10 points (0.81 and 1.04 respectively, p=0.01).

Conclusions/Significance: Patients underwent to SEMLS had better results regarding gait kinematic data than control group. Pre-operative GDI and gait velocity were related to outcomes in SEMLS group in the present study.

SP50
Radiographic changes of the mid-tarsal joint at a minimum follow-up of 5 years after calcaneal lengthening for planovalgus foot deformity

B CHO MIN1, K HYUK SUNG1, S YEOL LEE2, G HEE CHO1, M SEOK PARK1, C YOUB CHUNG1
1Seoul National University Bundang Hospital, Seoul, South Korea; 2Ehwa Womans University Mokdong Hospital, Seoul, South Korea

Background and Objective(s): Calcaneal lengthening is an effective surgical treatment for planovalgus foot deformity in children. However, there have been concerns about calcaneocuboid (CC) joint subluxation and subsequent osteoarthritic changes at the mid-tarsal joint. This study evaluate the long-term radiographic changes at the mid-tarsal joint, including the CC and talonavicular (TN) joints after calcaneal lengthening for planovalgus deformity in children, as well as to identify the risk factors for such changes.

Study Design: Longitudinal cohort study.

Study Participants & Setting: This study included 38 patients with 68 feet (mean age 10.5±3.7 years, 23 males and 15 females) who underwent calcaneal lengthening for planovalgus deformity.

Materials/Methods: Radiographic osteoarthritic changes at the CC or TN joint were defined as modified Kellgren-Lawrence grade ≥1. In addition, the calcaneal pitch angle, lateral talus-first metatarsal angle, degree of calcaneocuboid subluxation, and anteroposterior talus-first metatarsal angle were measured preoperatively, at 1 year postoperatively, and at the final follow-up.

Results: The mean follow-up duration was 7.6±2.6 years. All radiographic parameters, except CC joint subluxation, improved after calcaneal lengthening. Among the 68 feet, 31 feet (45.6%) showed radiographic osteoarthritic changes at the CC joint, 20 (29.4%) showed changes at the TN joint, and 37 (54.4%) showed changes at the CC or TN joint. The risk of radiographic osteoarthritic changes at the CC joint was found to be associated with increased age at surgery (OR=1.2, p=0.038). Additionally, the risk of radiographic osteoarthritic changes at the TN joint was found to be associated with increased age at surgery (OR=2.2; p=0.002), the preoperative AP talus-1st metatarsal angle (OR=1.1; p=0.044), and the degree of CC subluxation (OR=2.1; p=0.007).

Conclusions/Significance: About half of the assessed feet showed radiographic osteoarthritic changes at the mid-tarsal joint after calcaneal lengthening for planovalgus foot deformity at a minimum follow-up of 5 years. Increased age at surgery, preoperative severity of deformity, and degree of CC joint subluxation after surgery were associated with radiographic osteoarthritic changes at the mid-tarsal joint. Therefore, surgeons should consider these factors in the surgical correction of planovalgus foot deformity to prevent mid-tarsal arthritis.

SP51
Use of iliac crest allograft for dega pelvic osteotomy in patients with cerebral palsy

B CHO MIN1, K HYUK SUNG1, S YEOL LEE2, G HEE CHO1, M SEOK PARK1, C YOUB CHUNG1
1Seoul National University Bundang Hospital, Seoul, South Korea; 2Ehwa Womans University Mokdong Hospital, Seoul, South Korea

Background and Objective(s): Dega pelvic osteotomy has been performed in patients with cerebral palsy (CP) undergoing hip reconstructive surgery for hip displacement. However, there is no study investigating the outcomes after Dega pelvic osteotomy using allograft in patients with CP. This study investigated the outcomes of Dega pelvic osteotomy using iliac crest allograft in patients with cerebral palsy (CP) and the factors influencing allograft incorporation.

Study Design: Longitudinal cohort study.

Table 1. Incidence of radiographic osteoarthritic change at calcaneocuboid joint and talonavicular joint

|                | Calcaneocuboid joint | Talonavicular joint |
|----------------|----------------------|---------------------|
| Modified Kellgren-Lawrence grade | 0/1/2/3/4/5          | 0/1/2/3/4/5        |
| Calcaneocuboid joint | 37/25/6/0/0          | 48/11/9/0/0        |
| Talonavicular joint | 63/5                 | 60/8               |

Table 2. Associated factors with radiographic osteoarthritic change at calcaneocuboid and talonavicular joint

| Demographic factor | Adjusted ORS (95% CI) | p value | Adjusted ORS (95% CI) | p value |
|--------------------|-----------------------|---------|-----------------------|---------|
| Sex (male/female)  | 0.5(0.2-1.3)          | 0.152   | 0.3(0.1-1.6)          | 0.172   |
| Follow-up duration (year) | 1.2(0.9-1.6)     | 0.366   | 1.2(0.9-1.6)          | 0.366   |
| Laterality (right)  | 1.4(0.5-4.1)          | 0.958   | 1.0(0.2-5.3)          | 0.998   |
| Degree of CC subluxation | 1.0(0.4-6.4)     | 0.256   | 1.0(0.4-6.4)          | 0.256   |
| Age at operation (year) | 1.2(1.0-1.6)      | 0.038   | 2.0(1.3-3.9)          | 0.002   |
| Radiographic factor  |                        |         |                       |         |
| Preoperative LAT talus-1st metatarsal angle | 1.0(0.9-1.1) | 0.877 | 1.0(0.9-1.1) | 0.877 |
| Change of LAT talus-1st metatarsal angle | 1.0(0.9-1.1) | 0.410 | 1.0(0.9-1.1) | 0.410 |
| Degree of CC joint subluxation | 1.0(0.8-1.2)    | 0.217   | 1.0(0.8-1.2)         | 0.217   |
| Preoperative AP talus-1st metatarsal angle | 1.0(0.9-1.1) | 0.044 | 1.0(0.9-1.1) | 0.044 |
| Change of AP talus-1st metatarsal angle | 1.0(0.9-1.1) | 0.217 | 1.0(0.9-1.1) | 0.217 |

Multivariate analysis using generalized estimation equation was used to calculate the ORs and 95% CI.
Study Participants & Setting: This study included 115 patients (150 hips; mean age 8y7mo; 68 males, 42 females) who underwent hip reconstructive surgeries including Dega pelvic osteotomy using iliac crest allograft.

Materials/Methods: To evaluate the time of allograft incorporation, Goldberg score was measured according to the follow-up period on all serial postoperative radiographs. Radiographic delayed union was defined as a Goldberg score <6 by 6 months after the surgery. The acetabular index, migration percentage, and neck-shaft angle were also measured on the preoperative and postoperative follow-up radiographs.

Results: All radiographic indices were significantly improved after hip reconstructive surgery including the Dega osteotomy (all p < 0.001). AI was not changed at final follow-up (p = 1.000), but MP and NSA had significantly increased at final follow-up (both p < 0.001). The mean estimated time for allograft incorporation (Goldberg score ≥6) was 1.1 years postoperatively. Twenty-four hips (16%, 4 hips with GMFCS level IV and 20 hips with GMFCS level V) were classified as radiographic delayed union (Goldberg score <6) at 6 months after surgery. Nine hips (6%, all hips with GMFCS level V) had Goldberg score <6 at 1 year after surgery. However, all hips showed radiographic union at the final follow-ups and no hips underwent reoperation due to nonunion. There was no case of bone graft resorption, nonunion, dislodgement, and graft-related infections GMFCS level was significantly associated with radiographic delayed union (p=0.001). Patients with GMFCS level V had 6.9 times higher risks for radiographic delayed union than those with GMFCS level III & IV.

Conclusions/Significance: Dega pelvic osteotomy using iliac crest allograft was effective in correcting acetabular dysplasia, without graft-related complications in patients with CP. Furthermore, the correction of acetabular dysplasia remained stable during the follow-up period. However, physicians should consider that allograft incorporation in patients with GMFCS level V can be delayed compared with those with GMFCS level III & IV.

SP52
Selective control assessment of the lower extremity (SCALE) score correlates with joint-specific gait deviations in children with bilateral cerebral palsy
V KULKARNI, J DAVIDS, N CUNG, A BAGLEY
Shriners Hospitals for Children - Northern California, Sacramento, CA, USA

Background and Objective(s): Children with cerebral palsy (CP) have impaired selective voluntary motor control (SVMC) that affects their gait, coordination, balance, and function. The Selective Control Assessment of the Lower Extremity (SCALE) score allows for a joint-specific assessment of SVMC, providing a better understanding of the topographic impairment of a child’s motor control. The objective of this study was to understand the relationship between impairment of SVMC as measured by the SCALE score and gait impairment as measured by the Gait Deviation Index (GDI), Gait Profile Score (GPS), and the Movement Analysis Profile (MAP) in children with hemiplegic and bilateral CP.

Study Design: Retrospective Chart Review.

Study Participants & Setting: Children with cerebral palsy under age 18 referred to a Motion Analysis Center at a Pediatric Subspecialty Hospital

Materials/Methods: We identified all patients who underwent 3D Motion Analysis and SCALE scoring as part of their routine clinical assessment prior to undergoing any orthopaedic or neurologic surgery. Overall gait deviation was quantified by the GDI and the GPS, while deviation at the hip, knee, and ankle were quantified by the MAP. For topographic comparisons between SCALE and MAP, the more affected limb in children with hemiplegic or bilateral CP was analyzed. One-way ANOVA and independent t-tests were performed to evaluate differences in GDI, GPS, and SCALE values among GMFCS levels. Nonparametric correlations were performed to examine the relation of joint-specific MAP values to joint-specific SCALE scores at the hip, knee, and ankle.

| Table 1. Potential Risk factors for radiographic delayed union |
|-----------------|-----------------|-----------------|-----------------|
| Factor (per year) | Adjusted OR (95% CI) | P-value |
| Age (per year) | 0.9 (0.8 to 1.1) | 0.443 |
| Sex (male) | 0.4 (0.2 to 1.0) | 0.062 |
| GMFCS level (V) | 6.9 (2.2 to 22.2) | 0.001 |
| Body side (right) | 1.6 (0.6 to 4.0) | 0.363 |

SP52
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| Table 1. GDI, GPS, and Total SCALE Scores for Children with Hemiplegic and Bilateral CP |
|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| Age, years*, | 11.4 (2.9) | 11.1 (2.9) | 11.0 (2.8) | 6.7 (2.5) | 11.3 (2.7) | 12.3 (1.9) | 11.0 (1.9) | 11.0 (1.9) | 11.3 (2.7) | 12.1 (2.5) | 11.0 (2.6) | 11.0 (2.6) |
| Sex Distribution | 100/10 | 100/10 | 100/10 | 100/10 | 100/10 | 100/10 | 100/10 | 100/10 | 100/10 | 100/10 | 100/10 | 100/10 |
| GMFCS III | 251 (116) | 252 (112) | 250 (117) | 235 (107) | 248 (117) | 246 (116) | 230 (106) | 230 (107) | 247 (116) | 247 (117) | 237 (106) | 237 (107) |
| GMFCS IV | 251 (116) | 252 (112) | 250 (117) | 235 (107) | 248 (117) | 246 (116) | 230 (106) | 230 (107) | 247 (116) | 247 (117) | 237 (106) | 237 (107) |
| GMFCS V | 251 (116) | 252 (112) | 250 (117) | 235 (107) | 248 (117) | 246 (116) | 230 (106) | 230 (107) | 247 (116) | 247 (117) | 237 (106) | 237 (107) |
| p-value | 0.363 | 0.435 | 0.002 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 |

*Values expressed as mean (SD)