

Oral presentation

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Can muscle ultrasound density in early life predict motor outcome in spina bifida aperta?

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Background

Spina bifida aperta (SBA) is associated with neurological function loss caudal to the meningomyelocele (MMC). At birth, leg movements are transiently present, but they do not reliably predict motor outcome. Pediatric neuromuscular studies have shown that muscle ultrasound density (MUD) reflects neuromuscular condition. In the present study, we investigated whether MUD assessment can predict motor outcome in SBA.

Aim

To determine the relationship between neonatal MUD and motor outcome in SBA.

Materials and methods

We included 20 SBA neonates with MMC at thoraco-lumbar (n = 2), lumbar-sacral (n = 13) and sacral (n = 5) level. At 0, 6 and 12 months, MUD in SBA children was determined and compared with the morphological and neurological deficit (MRI and sensory/motor assessment, respectively) and compared with MUD in controls (n = 9). In neonates with MMC caudal to L4 (n = 7), we also associated the intra-individual increase in MUD caudal to the MMC (iMUD%) with motor outcome. iMUD% was characterized by: $[(\text{MUD}_{\text{gastrocnemius}} - \text{MUD}_{\text{quadriceps}}) / \text{MUD}_{\text{quadriceps}} \times 100\%]$. At one year, motor outcome was assessed by neurological examination.

Results

From birth onwards, MUD in SBA myotomes (cranial and caudal to the MMC) were higher than controls [SBA, gastrocnemius 66 (57–76) and quadriceps 75 (67–88); controls, 51 (21–70) and 67 (55–71), resp., each $p < 0.05$]. From 6 months onwards, MUD correlated with the morphological and functional level of the MMC ($p < 0.05$). MUD cranial to the MMC was higher than caudal to the MMC [SBA, gastrocnemius 59 (15–81) and quadriceps 67 (35–135); $p < 0.05$]. In 6 of 7 neonates with MMC caudal to L4, leg movements caudal to the MMC were present at birth. In all (7/7) neonates, a higher MUD caudal than cranial to the MMC could be visually assessed and confirmed by calculation [median iMUD% 43% (10–394%)]. This intra-individual increase in MUD caudal to the MMC either concurred with (1/7) or preceded (6/7) gastrocnemius muscle function loss.

Conclusion

In early life, MUD is higher in SBA than in controls and MUD caudal to the MMC is higher than cranial to the MMC. MUD parameters (like iMUD%) appeared associated with motor outcome. Our data indicate that assessment of MUD may provide additional information on motor outcome in SBA.