Sacral nerve stimulation in anorectal malformations – one step beyond intraoperative guidance

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Introduction

Direct stimulation of the ‘sphincter complex’ is the current gold standard for intraoperative guidance in anorectal malformation (ARM) repair. We postulate that although this approach identifies contractile muscle tissue it does not necessarily reveal neurophysiology relevant to function and prognosis regarding current status and further development of the anal sphincter.

In adults sacral nerve stimulation has been extensively studied and is applied for a broad spectrum of functional disturbances e.g. sphincter insufficiency and slow transit constipation.

Our aim was to demonstrate the feasibility of sacral nerve stimulation (SNS) during ARM correction to define the anal dimple before and to localize the sphincter muscles during preparation.

Patients and Methods

Seven children underwent sacral nerve stimulation during surgery for ARM. According to Wingspread criteria 1 had high, 3 had intermediate and 3 had low ARM. According to the Krickenbeck classification 3 had an anocutaneous fistula, 2 had a rectobulbar fistula, 1 had a rectovestibular fistula and 1 had a rectoprostatic urethral fistula. Their ages ranged from 23 days to 8 years. These children were monitored intraoperatively using sacral nerve stimulation.

Under ultrasound guidance sacral neuroforamina were identified and percutaneous needle electrodes were placed (Medtronic Inc.). Given the corresponding muscle response of S2 and S3 the correct needle placement is proven. Stimulation of S2 causes rotatory movement of the ipsilateral foot, S3 provokes a plantar flexion of the toe. For stimulation the Medtronic test stimulator Model 3625 was used. Stimulation was started at 1V up to 10V, 20 Hz, width of impulse 200 μs. Intermittently, direct stimulation was applied using the Pena method as the current gold standard in all cases.

Results

No complications from SNS were observed. We found a response in all patients (unilateral anal sphincter contraction and ipsilateral plantar flexion). Abnormal findings: crossover-innervation n=1. Follow up 2 months to 1 year, manometry up to 2 per patient. Excellent sphincter function in all cases.

Conclusion

SNS is a promising tool for intraoperative guidance as it allows intact neuronal circuits and their corresponding muscles to be identified thus helping to operate closer to the individual anatomy. Different threshold values might be predictive for the postoperative and possibly long term outcome and will be studied prospectively. We also found anomalies in innervation patterns as one case of crossover innervation.

References