

## Letter: Posterior Vertebral Column Subtraction Osteotomy for Recurrent Tethered Cord Syndrome: A Multicenter, Retrospective Analysis

To the Editor:

We read with great interest the article by Theodore et al<sup>1</sup> entitled “Posterior Vertebral Column Subtraction Osteotomy for Recurrent Tethered Cord Syndrome: A Multicenter, Retrospective Analysis,” recently published in *Neurosurgery*.

The authors elegantly analyzed a multicenter, retrospective cohort of 20 adult patients (mean age 36 yr) with recurrent tethered cord syndrome (TCS) which underwent posterior vertebral column subtraction osteotomy (PVCSO). Briefly, this procedure consists of removing 90% of a thoracolumbar vertebra, finally determines a spinal column's decrease, to reduce the tension on the spinal cord. In few words, PVCSO aims to reduce the imbalance between spinal cord and column length, which is the condition underlying the TCS. All the TCS presented were due to previous-treated lipomyelomeningoceles (LMMCs); these patients showed symptoms' progression of less than 2-yr duration. All patients in the present cohort received a vertebral osteotomy at either T12 or L1 with fixation 1 level above/below in 45% of cases; the remaining patients received a longer fixation. PVCSO determined, at 2-yr follow-up, relevant improvement or resolution of leg and back pain and sensory symptoms, with a 55% of amelioration in bowel incontinence, and 50% in urinary incontinence. Four complications were reported: durotomy, wound infection, revision for instrumentation failure, and the onset of new sensory deficits. The authors' conclusions underline the role of this technique as a definitive treatment for symptomatic retethering syndrome in case of failure of previous-treated LMMCs. As pointed by Theodore et al, when complete untethering is not achieved during the first surgery, the risk of long-term symptomatic retethering has been reported, in the past up, to 50% of patients; a second (or third, fourth, etc) surgery greatly increases the rate of possible complications as cerebrospinal fluid (CSF) leaks and wound infection or the onset of new neurological deficits; it is unclear if these procedures were carried out with intraoperative neurophysiological monitoring or not. In selected cases, PVCSO could be therefore a feasible solution, despite being a major procedure, deserving an expert team.

However, we think that the key point of spinal lipomas surgery is the meticulous definition of what they exactly are. In their pivotal paper, Pang et al<sup>2</sup> defined this heterogeneous complex of occult dysraphism according to the moment of failure during the different embryological stages, therefore describing dorsal, transitional, terminal, and chaotic lipomas. They also stated that “the literature describes one other lipoma type,

the lipomyelomeningocele, in which part of the distal conus extends alongside the fat through the dorsal bony defect into the extraspinal compartment, dragging with it a small collar of cerebrospinal fluid. The basic structure is most commonly that of a transitional lipoma but occasionally a dorsal one.”<sup>2</sup> According to this definition, LMMCs represent mainly transitional or dorsal lipoma with an extraspinal extension<sup>2,3</sup>; also in such cases, the aim of surgery should be to achieve a gross-total removal of the lipomatous tissues, followed by surgical “neurulation” of the neural placode and expansile graft duraplasty, to obtain a very low spinal cord/sac ratio (less than 30%). These strategies seem to achieve the best outcome, also in redo surgeries, not only in children but also in the adult population.<sup>4</sup> It should be interesting to know, among the present cases, if such parameters (mainly the cord/sac ratio) have been evaluated, especially amid the patients (8 on 20) that underwent a previous surgery only, and whether a second intradural surgery has been evaluated before proposing a vertebral osteotomy. In the redo group, after achieving a total/near-total resection, Pang et al reported a rate of 2.5% of complications, as CSF leak or wound infection, mainly in obese adults with prolonged immobilization. On the contrary, considering the short follow-up of the present patients' cohort, as Theodore et al stated, the long-term effects of PVCSO on spine destabilization, pseudarthrosis, or adjacent spinal segment disease are unclear.

Nevertheless, we agree with Theodore et al that “patients in a subacute, or earlier, stage of recurrent TCS would potentially benefit more from PVCSO than those in a more chronic stage of recurrence (>2 yr),” mainly about the long-term neurological outcome. Also from that point of view, we think that, due to the complexity of this spectrum of diseases, a complete presurgical evaluation should comprise standardized assessments as urodynamic studies, to choose the exact time of surgery.<sup>5</sup> Moreover, many of the rapidly progressing deteriorations in tethered cord are due to the occurrence of syringomyelia, due to a CSF block that needs adhesiolysis.<sup>6</sup>

In conclusion, we think that the treatment of LMMCs should be considered a one-shot surgery, whereas redo intradural procedures can determine a favorable outcome in case of retethering if incomplete untethering has been performed as first or subsequent operation. Theodore et al should be praised for their results, demonstrating that PVCSO can be considered as a feasible and successful procedure in case of multiple previous surgeries (7 of their patients underwent more than 3 untethering, up to 17 times), adding a relevant contribution to the neurosurgical armamentarium for such challenging disease.

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