COMMENTARY

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Dear Editor,
I read with great interest the case report from Silverstein and colleagues [1] about the surgical technique used to correct a congenital kyphosis in Uganda.

Having been involved in the care of spinal deformities in developing countries for the last 7 years, I would like to comment on this interesting case.

First, I commend the authors for performing such a procedure (pedicle subtraction osteotomy [PSO] at the cord level) with this nice immediate postoperative result. Performing complex spine surgery in such environment requires specific talents that range from extraordinary personal relationship skills (built over the years with the local surgical team), to very skilled surgeons used to perform such techniques of PSO at this level.

However, a few points need to be clarified.

Diagnosis
The diagnosis from the x-rays available appears to show a congenital kyphosis type 2 with lack of segmentation. Besides there seems to be multiple levels of defect of segmentation on the x-rays as it seems that the level T12– L1 and L1–L2 are fused anteriorly as well. The curve measured 65°, as indicated by the authors. Such a defect of segmentation will very likely progress in a 10-year-old girl who is most likely premenarchal; thus, I agree with the need to correct the deformity.

Her neurological picture is intriguing and I think this should be emphasized in the text as I am not aware of such a case causing myelopathy at such a young age as opposed to type I congenital kyphosis (defect of formation), which is notorious for neurological complications if not stabilized.

In the articles by McMaster and Singh [2] and Winter et al [3], all neurological complications from congenital kyphosis were observed in type 1 or 3 (mixed types) and none from type 2 [4]. Therefore, I have some serious doubts as to this congenital kyphosis causing neurological symptoms in this case. It is unfortunate that no MRI was available to rule out other causes of myelopathy or gait disturbance. If Silverstein et al [1] believed that kyphosis was responsible for myelopathy then a simple myelogram with a lateral shoot through x-rays could have been helpful.

Spinal cord monitoring
In the last 10 years it has become state of the art to perform spinal deformity correction with spinal cord monitoring (SCM). Performing spinal deformity surgery without SCM is obviously possible and one can use the Stagnara wake up as the only way of monitoring. For simple deformities in an underdeveloped environment, this may still be adequate. Still, such a test may be too late in the course of surgery to allow reversible cord insult in the case of complex PSO at the cord level. We know from Lenke and colleagues [3] that in 20% of cases of complex spine osteotomies performed at the cord level, the MEP disappear and action need to be taken promptly, I would be concerned to perform PSO at the cord level without SCM.

In today's high technical environment many surgical teams who have performed outreach spine surgery had SCM available. The equipment necessary to perform state-of-the art SCM can be brought in a carry-on luggage and many electrophysiological companies offer their service free of charge for such missions. So I think that performing complex osteotomies at the cord level during mission trips should not be done without SCM.

Surgical indication and technique
The kyphosis of the patient appears to measure 65°, which is still in a reasonable range, and such a deformity may only require minor corrections bringing the deformity to less than 50°.

One of the principles of kyphotic corrections is to stop the progression of the curve and to fuse and instrument the integrality of the Cobb angle (I eyeball it to be from T5 to L2 in this patient, as I do not have the whole standing spine x-rays). Thus, the instrumentation should have been more extensive, including the whole Cobb angle and stopping above the first lordotic disc. My concern is that where the instrumentation stopped short of the whole Cobb angle we shall see recurrence of the deformity, as the posterior column will keep growing and the anterior column with the defect of segmentation will not grow any longer. Wedging of the discs below may also contribute to recurrence of the deformity.

It would have been interesting to see a lateral shoot through the spine and see how the overall kyphosis from T5 to L1 would reduce. I would not be surprised if the deformity would have corrected to close to 50° on the supine bolster lateral shoot through x-rays.

Overall, I obviously cannot argue with this short follow-up success. My concern, however, is to see generalization of such complex techniques when a more simple posterior instrumentation with simple and less dangerous Smith-Petersen osteotomies (performed at the place of no anterior fusion existed) would have most likely been satisfactory to correct enough of the deformity and address the neurological issue if it ever was related to the

kyphosis. Complex spinal osteotomies at the cord level should not be performed without SCM even in developing countries. Rules of fusion levels in kyphotic deformities have been established since a long time and a long-term follow-up would be required to prove the contrary.

1. **Silverstein MP, St Clair SF, Lieberman IH** (2012) Thoracic pedicle subtraction osteotomy in a pediatric patient: a case report. *EBSJ;* 3(2):49–54.
2. **McMaster MJ, Singh H** (1999) Natural history of congenital kyphosis and kyphoscoliosis: a study of one hundred and twelve patients. *J Bone Joint Surg Am;* 81(10):1367–1383.
3. **Winter RB, Moe JH, Wang JF** (1973) Congenital kyphosis. Its natural history and treatment as observed in a study of one hundred and thirty patients. *J Bone Joint Surg Am;* 5(2):223–256.
4. **Lenke LG, Sides BA, Koester LA, et al** (2010) Vertebral column resection for the treatment of severe spinal deformity. *Clin Orthop Relat Res;* 468(3):687–969.