The Effectiveness of Universal Clamps in Controlling Coronal and Sagittal Profile in Surgical Correction of Neurological Scoliosis

G. La Rosa¹, G. Giglio¹, L. Oggiano¹
¹Research Institute Paediatric Hospital Bambino Gesù Palidoro (Rome), Paediatric Surgery Department, Orthopaedic Unit, Fiumicino (Rome), Italy

Spinal surgery in patients affected by neurological scoliosis is associated with increased bleeding, less satisfactory bone stock, longer fusions, and the necessity for fusion to the pelvis. The goal of treatment is to maintain a spine balanced in the coronal and sagittal planes over a level pelvis. Because hybrid constructs are associated with lower risk of complications and better sagittal correction, in our study we used a construct combining lumbar transpedicular screws and thoracic Universal Clamps (UC). The aim of our study is to assess the validity of the hybrid construct respect to deformity correction and restoring thoracic kyphosis in a prospective series of patients affected by neurological scoliosis. Between 2007 and 2010 we treated 92 patients affected by neurological scoliosis (65 F, 27 M). The aetiology was mostly cerebral palsy. The mean pre-operative Cobb angle was $96°±25°$, while the mean pre-operative thoracic kyphosis was $19°±8°$ (ranging from $-15°$ to $62°$). In all cases we performed a posterior approach only. In our construct we use a mean of six lumbar pedicle screws, seven thoracic UC, five hooks at the upper end of the curve, one or two iliac screws in case of pelvic obliquity greater than 20%, one or two rods on the concave side, one rod on the convex side and one iliac dedicated rod. In 3 patients a second posterior surgery was scheduled 15 days apart in order to strengthen the effect obtained by concave ribs section by adding several UC, thus treating a rigid thoracic deformity. Mean operative time was $240±30$ minutes in one step surgery (plus $120±30$ minutes in staged-surgery) with a mean blood loss of $1200±400$ ml. Mean radiation exposure time was 6 seconds (range 4,5-7). The mean post-operative Cobb angle was $22°±17°$ (average percentage of correction of $77±9%$ in the coronal plane), whereas the mean post-operative thoracic kyphosis was $26°±6°$ (average percentage of correction of $40±6%$ in the sagittal plane). In particular, the percentage of correction in cases with thoracic lordosis was about $120%$. In patients with pre-operative kyphosis between $30°$ and $40°$, physiological values were maintained. Furthermore, normal kyphosis was achieved in patients with pre-operative hyperkyphosis ($>40°$). At 36-months follow-up the average loss of correction was $7°±2°$ in the coronal plane and $2°±1°$ in the sagittal plane. Minor complications (pneumothorax, pleural effusion, atelectasia, intestinal disorders) occurred in 22 patients (24%), while major complications (infections, pseudarthrosis, rods breakage, iliac screw stress shielding, UC slippage, lamina breakage, dural leaks) was recorded in 9 patients (10%). The hybrid construct appears safe and effective in the treatment of neurological scoliosis, providing a good correction of the deformity and reducing operative time, radiation exposure and blood loss respect to all-screws constructs. The amount of coronal correction is excellent and the control of sagittal profile, in our experience, is better than with all-screws assembly. Moreover, the deformity reduction technique using the UC, progressively translating the spine toward the rods in the sagittal plane, has proved to be effective in controlling sagittal profile in patients affected by neurological scoliosis.