**STUDY DESIGN/SETTING:** Single-center retrospective study.
**PATIENT SAMPLE:** 636 patients with various occipitocervical diseases who underwent occipitocervical surgery were analyzed.
**OUTCOME MEASURES:** Their medical records and radiographs were reviewed and the postoperative complications, including those at the occipitocervical region and donor-site, were analyzed.
**METHODS:** Between May 1985 and May 2011, 636 patients with various occipitocervical diseases underwent occipitocervical surgery, with or without internal fixation. Two physicians were assigned for patient follow-up. Their medical records and radiographs were reviewed and the postoperative complications, including those at the occipitocervical region and donor-site, were analyzed.
**RESULTS:** Six hundred cases were followed-up from 18 months to 27 years with an average of nine years and eight months, and the follow-up rate was 94.4%. There were 30 cases with complications after surgery in the uninstrumented fusion group, the incidence was 38.5%. These included 22 patients (28.2%) with complications in occipitocervical region and 8 patients (10.3%) with donor-site complications. One hundred complications presented in the instrumented fusion group, the incidence was 19.1%. These included 66 patients (12.6%) with complications in occipitocervical region and 34 patients (6.5%) with donor site complications. Perioperative complications included vertebral artery injury, spinal cord injury, nerve root injury, suffocation, cerebrospinal fluid leakage and infection. Mid- to long-term complications included bone-graft displacement or absorption, aggravated vertebral dislocation, improper screw placement, spinous process fracture, and internal fixation breakage. Donor-site complications were hematoma, pain and infection.
**CONCLUSIONS:** Surgery of the occipitocervical region carries a relative high risk for complications, especially if no instrumentation is used. The key points in reducing complications are the surgeon's familiarity with the anatomy of occipitocervical region and the appropriate internal fixation. Vical region and donor site, were analyzed.
**FDA DEVICE/DRUG STATUS:** This abstract does not discuss or include any applicable devices or drugs.

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### P13. Traumatic Cauda Equina Herniation Occurring with Thoracolumbar and Lumbar Burst Fractures

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**BACKGROUND CONTEXT:** A burst fracture is a relatively common traumatic injury in the thoracolumbar and lumbar spine. Dural laceration and cauda equina herniation by burst fracture can be found through an anterior or posterior approach. Few reports have been published regarding cauda equina herniation resulting from spinal burst fractures.
**PURPOSE:** To document the incidence and evaluate the sequelae of cauda equina herniation found during decompression and fusion surgery for burst fractures.
**STUDY DESIGN/SETTING:** A single-center retrospective study.
**PATIENT SAMPLE:** 416 patients who had been treated for thoracolumbar and lumbar burst fractures at our department were analyzed.
**OUTCOME MEASURES:** Data collected included demographics, injury mechanism, radiographs, surgical procedures, outcomes and follow-up.
**METHODS:** A retrospective hospital records and radiographs review of 416 patients who had been treated for thoracolumbar and lumbar burst fractures in our department between June 1, 2008 and June 1, 2011 was performed. All of the patients had been operated on through an anterior or posterior approach. Data collected included demographics, injury mechanism, radiographs, surgical procedures, outcomes and follow-up.
**RESULTS:** The operation was completed successfully in 416 patients. The cauda equina herniation was observed in 49 of 416 (12%) patients, all of the herniations were identified in lumbar burst fractures. These patients were 40 males and 9 females, with a mean age of 33.7 years. The posterior approach group included 301 patients (215 males and 86 females), the incidence rate of cauda equina herniation was 13% (40/301). The anterior approach group included 115 patients (80 males and 35 females), the incidence rate of cauda equina herniation was 8% (9/115). Forty-four patients (90%) with cauda equina herniation had neurological deficits, 5 patients (10%) were intact neurologically despite the finding at surgery that a significant proportion of their cauda equina rootlets were entrapped in the dorsal lamina fracture. Both vertebrae burst fracture and lamina fracture was observed in 38 of 40 patients with posterior cauda equina herniation; the incidence rate was 95%.
**CONCLUSIONS:** This retrospective study detected traumatic cauda equina herniation occurred in 12% of the patients with thoracolumbar and lumbar burst fractures that were treated by surgery. Repositioning of cauda equina rootlets and primary repair of dural laceration is indicated. Patients with neurological deficits and a laminar fracture associated with a lumbar burst fracture have an increased risk of traumatic cauda equina herniation.
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### P14. Characterization of Significant Neurophysiologic Intraoperative Monitoring Events in Severe Spinal Deformity Surgery

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**BACKGROUND CONTEXT:** Neurophysiologic intraoperative monitoring (NIOM) is a standard tool for avoiding or mitigating neurological injury during spinal deformity surgery in the developed world. Despite the severity of deformities, NIOM is used infrequently in the developing world. The advent of reliable neuromonitoring has obviated the need for a wake-up test in many instances; however, the role of an intraoperative wake-up test in this setting is unclear.
**PURPOSE:** To our knowledge, there are no studies characterizing NIOM events and their significance in the developing world. The risk of NIOM events in severe spinal deformity correction is relatively high. However, the significance and reversibility of these events in this setting is unknown. The purpose of this research is to characterize events by their triggers, and to identify reversible and irreversible triggers.
**STUDY DESIGN/SETTING:** A prospectively collected database was reviewed for all spinal deformity surgery performed at a single site in a West African hospital over a 12-month period.
**PATIENT SAMPLE:** All cases of spinal deformity surgery performed at a single site were reviewed for inclusion. This included patients referred from several African countries for surgical intervention.
**OUTCOME MEASURES:** A significant NIOM event was defined as a 50% or greater decrease from baseline in the amplitude of tibial nerve SSEP, or 75% decrease in the MEP amplitude recorded from the lower extremity muscle with the largest baseline response. A full neurologic recovery was defined as a return to baseline for all MEP and SSEP signals.
**METHODS:** All patients treated at a single site over a 12-month period were reviewed. Patients were included for analysis if complete demographic data, operative reports and neuromonitoring data were available for review. The surgical and systemic triggers of NIOM events and neurological status upon surgical completion were compiled.
**RESULTS:** 88 patients met inclusion criteria. The average age was 14 years (3-28), and male:female ratio was 43:45. Diagnoses included idiopathic scoliosis (20), congenital scoliosis (9), congenital kyphosis (7), congenital kyphoscoliosis (11), idiopathic kyphoscoliosis (5), early-onset scoliosis (6), post-infectious kyphosis (15), and other (15). The average kyphosis was 108°; (54-176°); the average scoliosis was 100°; (48-177°). There were 44 separate NIOM events in 34 patients (39%). The most

common triggers were traction or positioning (16), SPO/Ponte/VCR osteotomies (10), and intraoperative corrective maneuvers or implant placement (9). Upon surgery completion, 100% (10/10) events triggered by corrective maneuvers and implant placement resolved, 75% (12/16) of events resulting from traction or positioning resolved; 0% (0/9) of events associated with corrective osteotomies resolved completely.
**CONCLUSIONS:** NIOM events are encountered commonly during severe spinal deformity surgery. The most frequent event trigger was intraoperative traction or positioning. However, the most common cause of persistent NIOM deterioration was the performance of osteotomies. Unlike traction- or instrument-related correction, osteotomies produced irreversible events, possibly from canal intrusion by instruments or sudden localized deformity change. Caution should be taken when performing SPO/Ponte osteotomies.
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### P15. Analysis of Perioperative Major Non-Neurologic Complications in 105 Posterior Vertebral Column Resection (PVCR) Procedures for Severe Rigid Deformities during Ten Years: Introspection on the Balance between Patients' Risk and Benefit

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**BACKGROUND CONTEXT:** Though surgeons constantly attempted to increase the corrective efficacy and neurological safety following posterior vertebral column resection (PVCR), there are still significant risks of major and potentially life-threatening complications. So it is necessary to review the potential benefits against possible serious complications of patients.
**PURPOSE:** To analyze the major non-neurologic complications (MNNC) following PVCR procedures for severe rigid deformities, and to identify the factors that may increase the risk.
**STUDY DESIGN/SETTING:** Retrospective study.
**PATIENT SAMPLE:** A total of 105 consecutive patients undergoing PVCR for severe rigid deformity correction between 2004 and 2013 at a single institution.
**OUTCOME MEASURES:** Statistical analysis.
**METHODS:** The demographic data, medical and surgical histories, perioperative and final follow-up radiographic measurements, and prevalence of perioperative (intraoperative to 7 days postoperation) MNNC, including death, cardiac arrest, myocardial infarction, stroke, malignant hyperthermia, coagulopathy (DIC), irreformable hypotension, optic deficit, pulmonary embolism, respiratory failure, pneumonia, deep infection, sepsis, and major vessel injury, were reviewed.
**RESULTS:** The study included 58 female and 47 male patients. The mean age at the time of surgery was 18.9 (10-45) years. The major curve of scoliosis was 108.9±25.5 preoperatively and 37.2±16.8 at the final follow-up, and segmental kyphosis from 89.8±31.1 to 30.4±15.3. MNNCs totaled 31 in 24 patients: 16 respiratory complications (PE 2, respiratory failure 8, and pneumonia 6) in 13 patients, 7 cases of 9 cardiovascular adverse events or irreformable hypotension, 1 malignant hyperthermia and 1 optic deficit. There were 3 wound infections, and one of them had to partly remove the implant for infection control. What's more, one neurofibromatosis died at one day after operation. After comparing patients with MNNC and without MNNC under various subgroups, factors showing no relationship with an increased prevalence of MNNC were age, BMI, operative duration time, presence of cardiac disease or neural axis malformation, and both sagittal and coronal correction rate. However, patients with T6 and upper resected level, major scoliotic curve larger than kyphotic curve, and undergoing PVCR at the early period, showed a trend toward more MNNC encountered. Also, increased blood loss and lower preoperative pulmonary function were associated with a higher prevalence of MNNC.
**CONCLUSIONS:** Patients with PVCR experienced expected high rates of MNNC, with an overall incidence of 22.9%. The factors noted to increased major non-neurologic complications include upper thoracic curve, severe kyphoscoliosis, increased blood loss, and serious ventilation dysfunction. It implied that this powerful procedure shouldn't be the first choice in caring for the overwhelming majority deformity patients, especially for inadequate experienced teams. The indication and contraindication of PVCR must be integrated and standardized. When considering the use of PVCR, it is important to recognize the significantly higher inherent risks and provide appropriate preoperative counseling on the risk/benefit ratio of surgery.
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### P16. The Changes of SEP/MEP following Ligating Spinal Cord Segmental Vessels in Applying Posterior Vertebral Column Resection (PVCR) to Treat Severe Rigid Spinal Deformity

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**BACKGROUND CONTEXT:** Intraoperative monitoring (IOM) is well known to improve the security of the spinal cord in spinal surgery, especially in the surgical correction of spinal deformity. In applying posterior vertebral column resection (PVCR) to treat severe spinal deformity, ligating several spinal cord segmental vessels is unavoidable for exposure as well as vertebral resection, and this process threatens the safety of spinal cord. Only a few studies are related to the potential effects to spinal cord following ligating segmental vessels.
**PURPOSE:** To study the changes of SEP/MEP following ligating spinal cord segmental vessels in applying PVCR to treat severe rigid spinal deformity.
**STUDY DESIGN/SETTING:** A retrospective study.
**PATIENT SAMPLE:** Twenty-one consecutive patients with severe rigid spinal deformities treated by PVCR were reviewed.
**OUTCOME MEASURES:** Statistical analysis.
**METHODS:** These 21 patients were divided into 5 groups based on the number of spinal cord segmental vessels ligated in PVCR. IOM was used in the whole process of PVCR as well as correction for monitoring the neurological status. The amplitude and latency changes of SEP/MEP were specially recorded and analyzed in those 5 groups during and following segmental vessel ligation.
**RESULTS:** The preoperative signal of SEP and MEP was normal. The mean number of vessels ligated was 1.9 pairs (1~3 pairs), and no more than 3 branches were ligated on the same side. In the 5 groups, the amplitudes of SEP declined 53.2%, 59.1%, 66.9%, 71.7%, 78.2% respectively; the mean durations were 3.2, 3.6, 4.2, 4.9, 5.2 min respectively. In 10 cases, the amplitudes of SEP fell more than 50% following 1 pair of vessels being ligated, but gradually recovered to the baseline after 3.2 min. In another case, the amplitude of SEP declined more than 50% after 2 pairs of vessels were ligated and the duration was 5.2 min before recovering to the baseline. For all patients, the latency stages were no more than 10%, and the MEP was normal. No neurological deficit occurrence in all cases.
**CONCLUSIONS:** In PVCR, SEP is so sensitive that the amplitude would decline more than 50% following 1 pair of vessels was ligated. The amplitude of SEP would fall more than 50% after no more than 3 pairs of vessels were ligated, but which can gradually recover after a short duration. The more number of vessels ligated, the amplitude of SEP will decline more obviously and the duration will last much longer. So following 3 pairs of vessels ligated, the effect to the spinal cord is limited, and the risk of spinal cord injury will be greatly increased following the number of segmental vessels ligated.