SURGICAL DECISION MAKING & INTRAOPERATIVE CHALLENGES IN C2 FRACTURES
Dhandapani SS
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CVJ injuries constitute around 20% of Cervical spine injuries, most of which are at C2 level. 35 patients with C2 fractures were studied for various factors, clinicoradiological findings, surgical intervention and outcome. Various stabilization methods (Halo, Odontoid screw, and C1-C2 fusion) were utilized in managing these patients as per the clinicoradiological presentation. The admission ASIA scale, timing of presentation, surgical method of stabilization and outcome were analyzed. Overall 25 patients improved, 10 remained unchanged (instability corrected). The dilemmas in management, intraoperative challenges and the role of various factors in determining outcome will be discussed. C2 fractures managed promptly by appropriate modality yield satisfactory results.

ENDOSCOPIC INTERLAMINAR APPROACH TO LUMBER DISC: ANALYSIS OF FIRST 50 CASES BY EASY GO SYSTEM
Vijay Parihar, YR Yadav, Shailendra Ratre, Yatin Kher
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Aim: Many spinal endoscopic systems available, which are difficult to apply and handle, which results in steep learning curve.
Method: Easy GO system consists of various dilators, two different work sheaths, two different 30° endoscopes, and an endoscope holder. Analysis of first 50 cases shows easy intra-operative handling with standard microsurgical techniques, and avoidance of a prolonged learning curve.
Result: 50 spinal surgeries were performed in degenerative lumbar disc cases between April 2012 and March 2013 (One year) with minimal follow up of one year. Results were analyzed.
Conclusion: The Easy GO system was easy and safe to handle with the standard bimanual microsurgical technique and good postoperative results.

MICRODISCECTOMY OR TUBULAR DISCECTOMY: BETTER OPTION FOR MANAGEMENT OF LUMBAR DISC PROLAPSE
Pallav Bhatia, Harvinder Singh Chhabra
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The aim of this study was to compare immediate post operative and 1 year outcome of patients undergoing tubular discectomy with those undergoing conventional microdiscectomy and to evaluate the learning curve as well as complication rates of tubular discectomy.

Materials And Methods 46 patients of microdiscectomy (MD) and 102 (48 early and 54 late) patients of tubular discectomy (TD) were studied for the following data: baseline characteristics, visual analog scale (VAS) for leg pain and back pain, ODI scores, intra and post operative complications and reoperation rates.
Results: The VAS score for leg pain, back pain and ODI scores showed improvement in both groups during the first year after surgery. Return to work and mean hospital stay was shorter in case of tubular discectomy as compared to microdiscectomy group. The mean duration of surgery was 34 minutes shorter for conventional microdiscectomy. Incidence of dural tear was 6.5% in MD group and 10.4% in early TD and decreased to 7.4 % in late TD group.
Conclusion: This study revealed that rate of recovery is significantly faster for tubular discectomy as compared to conventional microdiscectomy. In contrast, we encountered fewer complications in microdiscectomy approach as compared to tubular discectomy which also decreased as we gained experience.

C1-2 JOINTS IN CONGENITAL ATLANTO-AXIAL DISLOCATION: ORIENTATION AND MANAGEMENT IMPLICATIONS
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Aim: To study the C1-2 facets in patients with congenital Atlanto-axial dislocation and their bearing on the presentation and management.
Material and methods: 36 patients of congenital AAD were studied in the last 3 years. 24 patients had Irreducible AAD (not reducing on traction) and remaining 12 had reducible AAD. CT scans were obtained and the C1-2 joints were studied in axial, sagittal and coronal planes. The obliquity of (C1-2) joints was measured using the novel inferior C1 coronal and sagittal angles. The relationship of obliquity of joints, age and reducibility was studied and these were compared with normal subjects. The amount of facet to be drilled was decided by these angles. Direct posterior reduction was attempted by drilling the facets flat in all. Anomalous vertebral arteries were detected with preoperative CT angiograms and addressed appropriately intraoperatively.
Results: The inferior C1 sagittal and coronal angles were significantly acute in patients with IrAAD as compared to those
with RAAD and normal spine. An inferior sagittal angle more than 150 degrees predicted reducibility. More acute the angle, younger was the age of presentation. Relatively acute coronal angles were noticed in patients with telescoping (central or vertical dislocation). Intraoperative reduction could be achieved after drilling the facets nearly flat. The fusion rates were over 90%.

**Conclusions:** The congenital AAD appears to be a dynamic process, progressing with time. The acuteness of the inferior C1 sagittal facet angles possibly determines the age at presentation and reducibility. Coronal angle determines the telescoping of C2 within C1. Intraoperative reduction through a direct posterior approach can be achieved in patients with IrAAD by drilling the wedge of C1-2 facets to make the joints relatively flat. Comprehensive facetal drilling also increases the fusion rates.

**AXIS ANATOMY AND DIMENSIONS RELATIVE TO TRANSLAMINAR SCREW PLACEMENT IN INDIAN POPULATION**

RAMAN MOHAN SHARMA, Nupur Pruthi, Paritosh Pandey Rose dawn, Yogitha Ravindranath, Roopa Ravindranath

**NIMHANS, Bangalore**

**Introduction:** The technique of intralaminar screw placement for achieving C2 fixation has been recently described. To the best of our knowledge there is no study (cadaveric or radiological) done in Indian population to detect suitability of axis bone for laminar screw fixation. We also failed to find any study which has analyzed axis bone with all the three modalities; morphometry, computer tomography and fluoroscopy. Hence the purpose of the study was to provide the morphometric and radiological measurements in Indian population and to determine the feasibility of safe translaminar screw placement in this population.

**Material & Methods:** A total of 38 dry axis vertebrae from adult South Indian population were subjected to morphometric, CT scan and fluoroscopic analysis.

**Results:** Middle 1/3rd lamina was the thickest portion (mean 5.17mm +/- 1.42mm). A total of 32 (84.2%) specimen were having midlaminar width in both lamina greater than 4 mm, however only 27(71%) out of them are having spinous process more than 9mm. CT scan measurement in middle and lower 1/3rd lamina was found to be strongly correlated with the direct measurement. A novel method has been described to use introperative fluoroscopy for safe placement of C2 laminar screw.

**Conclusion:** There is high variability in the thickness of the C2 lamina. As compared to western population, the axis bones used in the present study had smaller profiles. Intraoperative fluoroscopy is adequate for safe placement of laminar screw.

**RISK STRATIFICATION OF VERTEBRAL ARTERY VULNERABILITY DURING SURGERY FOR CONGENITAL ATLANTO-AXIAL DISLOCATION WITH OR WITHOUT AN OCCIPITALISED ATLAS**

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**Objective:** This prospective study attempts to define anatomical variations that render vertebral artery (VA) at the craniovertebral junction (CVJ) vulnerable to injury during transoral decompression and posterior stabilisation procedures; and, to propose a classification that helps in preoperative risk stratification.

**Methods:** Total 104 patients [65 with atlanto axial dislocation (AAD); 39 controls] underwent a 3D multplanar CTA to study anatomical variations in VA size, course and anomalous medial deviation as well as in the type of axial isthmus and rotational deformity/tilt at the CVJ. The VA/foramen transversarium diameter; “stretched loop” sign of VA; and, C1-2 facet joint angle were also assessed. A medial VA deviation that brought it in close proximity to the trajectory of the surgical approach was evaluated (P value ≤.05 significant).

**Results:** An increased predisposition to VA injury was present in 23 (35.4%) patients [persistent first trigeminal artery (n=20; 30%); fenestrated VA(n=1; 1.53%), and low-lying PICA(n=2; 3.0%)] where VA crossed the C1-2 facet joint; 8 (12%) with an anomalous medial deviation; 12 (18%) with a high-riding VA at C2 and a narrow axial isthmus; and, 13 (20%) with rotation/tilt at the CVJ. A normal score of 5 was obtained in 21 patients; and, a score of 6-9 (that progressively indicated an increased vulnerability of VA to iatrogenic injury) in 44 patients. The “AAD with an occipitalised atlas” group was associated with a significant medial deviation (Right: P=.00 and Left: P=.001) and the presence of "stretched loop" sign (n=32 out of 47 patients) of VA when compared with patients in the “AAD without an occipitalised atlas” (n=2 out of 18 patients) and the control groups (0 out of 39 patients) [P=.00].

**Conclusions:** A preoperative detailed risk assessment of anatomical variations in the size and course of VA at the CVJ significantly reduces chances of its iatrogenic injury.

**A CLINICAL STUDY AND SURGICAL MANAGEMENT OF CONGENITAL ATLANTO-AXIAL DISLOCATION**

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**Aims and objectives:** The surgical management of cranio-vertebral junction issues is complex due to the relative difficulty in accessing the region, critical relationships of neurovascular structures and the intricate biomechanical issues involved. Atlanto-axial instability with/without basilar invagination is significantly common in India and in the Indian subcontinent.Even in India,there is a disproportionately high incidence in northwestern belt of the country.No genetic factor has been identified that
could explain the discrepancy in incidence. Our understanding in the subject suggests that muscular weakness of the neck due to protein-calorie malnutrition might be the key initiating factor in providing a foundation of instability that leads to formation of abnormality of basilar invagination. The purpose of this study is to study the clinical evaluation of these cases, the radiological assessment and effectiveness of the surgical procedures to correct the pathophysiology in these cases in our set up.

**Methods:** The present study has been conducted on 60 patients with congenital atlanto-axial dislocation with basilar invagination from 2008 to 2014. From surgical point of view we classified the cases based on reducibility of atlanto-axial dislocation and basilar invagination after effective skull traction with reference to standard skull base lines into reducible and non-reducible varieties. MRC grading was used to assess power, Ranawat grading of pain and neurological status was used to study the clinical outcome.

**Results:** In our study all patients were from poor socio-economic status with majority of patients were in the age group of 11-20 years with male preponderance. Duration of symptoms ranged from 3 months to 1 year with 6 months being average. Pyramidal system involvement was present in 84% of cases and 17% had additional features of cranial nerve and sensory system involvement. 17% of our cases were of reducible variety and 83% were of irreducible variety. The pre-op clinical status and post-op neurological outcome of surgery was assessed based on Ranawat neurological assessment and pain assessment scale. Those with reducible variety had relatively less severe pre-op neurological abnormality and improvement was present in 100% of cases. Neurological disturbances were much pronounced in non-reducible variety and post-operatively improvement in power and gait was present in 75% of cases, radiculopathy improved in 67% of cases, sensations improved in 60% of cases and 50% had cranial nerve improvement. Mortality was nil in reducible variety treated with posterior fixation alone and it was 5% in non-reducible (fixed) variety who were treated by transoral odontoidectomy with posterior occipitocervical fixation. Major complications were pulmonary infections, CSF fistula followed by meningitis, loosening of screws with erosion of scalp by rods requiring re-exploration. 16% of cases required re-exploration which were successfully managed. Post op fusion rates were in the range of 95%. Regular follow up showed nearly 100% restoration to normal day to day activities at the end of 24 months.

**Key words:** atlanto-axial dislocation, basilar invagination, transoral odontoidectomy, occipitocervical fixation.

**A STUDY OF CLINICAL FEATURES AND MANAGEMENT OF TETHERED CORD SYNDROME**

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- Tethered cord syndrome (TCS) is a clinical spectrum of various origins that arises from tension on the spinal cord which has its inception at a very early stages of embryogenesis. These abnormalities may include the conus medullaris in a lower than normal position, fatty infiltration of the filum terminale, lipomyelomingocele, myelomingocele, meningocle, split cord malformations, dermal sinus and intraspinal tumors.  
- The clinical constellation of signs and symptoms associated with TCS may include dermatologic, urological, gastrointestinal, neurological, and orthopedic findings.  
- The current study focuses on TCS by age incidence, sex distribution, varied cutaneous stigmata, neurological manifestation, radiological features, operative procedures and post operative outcome.

**Materials and Methods:** All patients both children and adults, who presented in our department from July 2011 to July 2014 with signs and symptoms of TCS were included in our study.  
- In cases of swelling over back where there was no radiological evidence of tethering and no clinical features of tethering of cord were excluded from study.  
- MRC grading was used to assess power, Magnetic resonance imaging was used to assess the nature of tethering and associated pathology. Ultrasonography was used to assess urological abnormality.

**Results of the Study:** In our study majority of our patients were in the age group of 1-12 months which constituted 43% of cases and 96.7% of cases were in pediatric age group (<18yrs). 3.3% of cases were >18yrs. Earliest age of presentation in our series was 1 month and 40 years was oldest. There was female preponderance with incidence in females being 55% and males being 45%.  
- Among the varied cutaneous stigmata, 46.67% of cases presented with lipomeningocele, 33.33% with meningocele, 10% with tuft of hair (hypertrichosis), 10% with recurrent ulcerations of foot, 5% each with foot deformities, dural sinus and scoliosis, 3.33% with skin dimpling, and 5% presented with no external cutaneous stigmata. 6.67% of cases presented with re-tethering after previous surgery for meningocele with average duration after primary surgery being 7 years. 1 case presented after 35 years of previous surgery.  
- Radiologically identified abnormality being spinal bifida present in 66.67% of cases, dorsal lipoma in 20%, terminal lipoma in 20%, transitional lipoma in 15%, combined lipoma in 11.67%, low lying conus in 75%, dural ectasia in 8.33%, diastematomyelia in 11.67%, diplomyelia in 8.33%, syringomyelia in 25%, intraspinal dermoid in 10%, agenesis of lower lumbo-sacral segments in 8.33%, associated hydrocephalus in 15% and mucoid degeneration of lipoma in 1.67% of cases.  
- Depending on site of these spinal cord abnormalities 3.33% were in cervical level, 11.67% in dorsal level, 15% in dorso-lumbar level, 36.67% in lumbar level, 28.33% in lumbo-sacral level, 5% in sacral level.  
- 33.33% of cases presented with bladder incontinence and 13% of cases had associated bowel incontinence. Sensory disturbances were present in 25% of cases. 50% of cases presented with weakness of lower limbs and among them 5% had grade 0, 6.67% had grade 1, 11.67% had grade 2, 13.3% had grade 3 and 13.3% had grade 4.5% of cases had hypertonia in lower limbs, 9% had hypotonia and in 11.67% of cases reflexes were brisk and in 26.67% of cases reflexes were absent. Among patients with bladder incontinence 60% of them had significant post-void residual urine on ultrasound and...
40% of them empty bladder. • Among orthopedic problems 13.3% of cases had foot deformities in the form of equinus deformity, forefoot varus, club foot deformity and resorption of distal ends of toes. Recurrent ulcerations were present in 10% of cases and majority were associated with foot deformities. • In 6.67% of cases kyphoscoliosis was present and these were most commonly found with tethering of cord in dorsal and dorsolumbar region. limb length discrepancy along with thinning of limbs was present in 10% of cases. these set of patients had abnormal gait and backache which worsened on doing strenuous activity. These problems were observed most commonly in children between 10-18 yrs which corresponds to age of rapid growth. • After surgery 15% of cases were restored to normal grade 5 power, 11.67% of cases had partial improvement by two grades. 48.3 % of patients who had normal pre-op power 5 were same in post-op period, 10% of cases who had weakness pre-operatively remained same. 5% of cases with normal pre-op power deteriorated to lower grades and 10% with existing weakness showed deterioration in power post-operatively. 3.3% of cases had paraplegia post-operatively. • Among patients with bladder incontinence 16.67% had same pre-op status. partial improvement in bladder control was observed in 16.67% and 5% of cases who were continent pre-operatively had developed denovo incontinence. Bowel continence was restored to normal in 10% of cases, and 11.67% of cases had partial improvement. • In patients with recurrent ulcerations there was improvement in healing of ulcers in 75% of cases. patients with foot deformities, limb length discrepancy and kyphoscoliosis underwent orthopedic corrections after detethering procedure. These patients showed significant improvement in gait and reduction of backache at the end of 1 year follow up. • Clinico-radiological co-relation showed that among patients who had swelling over lower back 31.67% had lipoma,23.33% had meningomyelocle, 5% had dermoid cyst, 1.67% had sacral agenesis, 3.33% had diastametamyelia. • Among patients with tuft of hair, diastametamyelia was present in 6.67% of cases, diplomyelia in 3.33%, dermoid in 3.33%, sacral agenesis in 3.33% of cases. Among patient with dermal sinus 1.67% had spinal dermoid, 3.33% had diplomyelia. Among patients with dimpling of skin 1.67% had diastematomyelia and diplomyelia in 3.33% of cases. • Most often complication in post operative period was related to csef leak and pseudomeningocele formation which was present in 20% of cases. Re-exploration for dural repair was carried out in 5% of cases. • Follow-up was carried out at regular intervals which showed 45% of patients who had residual weakness were restored to normal power at the end of 1 year and total 60% of cases were restored to normal power at 2 year follow up. Among 10 patients who had partial improvement in bladder incontinence, 60% regained normal continence and maintained on intermittent self catheterization at the end of 2 year follow-up. Patients with orthopedic problems like scoliosis and foot deformity were rehabilitated to near normal activity after corrective orthopedic surgery and subsequent physiotherapy. Conclusion: Tethered cord can present with varied clinical, neurological, urologic, gastrointestinal and orthopedic abnormalities which have severe impact on normal growth and development a child. Early recognition of this underlying abnormality by various cutaneous stigmata, proper neurological and radiological assessment and timely intervention can reduce the morbidities and deformities associated with this abnormality and improve quality of life in these patients.

Key words: tethered cord syndrome, diastametamyelia, diplomyelia, incontinence, cutaneous stigmata

ENDOSCOPIC INTERLAMINAR APPROACH TO LUMBER DISC: ANALYSIS OF FIRST 50 CASES BY EASY GO SYSTEM
Vijay Parihar, Department of Neurosurgery, Govt Medical College Jabalpur, India

Many spinal endoscopic systems available, which are difficult to apply and handle, which results in steep learning curve.

Method: Easy GO system consists of various dilators, two different work sheaths, two different 30° endoscopes, and an endoscope holder. Analysis of first 50 cases shows easy intra-operative handling with standard microsurgical techniques, and avoidance of a prolonged learning curve.

Result: 50 spinal surgeries were performed in degenerative lumber disc cases between April 2012 and March 2013 (One year) with minimal follow up of one year. Results were analyzed.

Conclusion: The Easy GO system was easy and safe to handle with the standard bimanual microsurgical technique and good postoperative results.

RESPONSE OF HIRAYAMA DISEASE TO SURGICAL INTERVENTION: CASE REPORT
Anish Goyel, Mukesh P Patel, Dr K B Shah, Dr Navneet Kumar, Dr Sunil Kumar, Dr Anish Goyel
Nhl Municipal Medical College,V S Hospital

Hirayama disease also known as monomelic amyotrophy, primarily involves distal upper limb extremities. It differs from the known types of motor neuron diseases because of its nonprogressive behavior and pathologic findings of focal ischemic changes in the anterior horn of the lower cervical cord. We present a young male with Hirayama disease who had a left upper extremity involvement which was progressive in nature. He didn't respond with initial treatment of cervical collar. Consequently surgical intervention improves muscle weakness and decrease the neurological deficit.

CLINICO-RADIOLOGICAL ANALYSIS OF ADJACENT SEGMENT DISEASE IN CERVICAL DISC REPLACEMENT- OUR EXPERIENCE
Ramesh Chandra V V, Bcm Prasad, Svims Tirupati

Anterior cervical disectomy and fusion was the gold standard for cervical disc disease. Adjacent segment disease is known to occur
in patients undergoing fusion. Cervical disc replacement a novel alternative was proposed to tackle this adjacent segment disease. The efficacy of cervical disc replacement in preventing this adjacent segment disease needs to be evaluated. Introduction: To assess the clinical and radiological outcomes in a cohort of patients prospectively enrolled to undergo cervical disc arthroplasty with the Prestige LP cervical disc system (Medtronic Sofamor Danek, Memphis, TN, USA) and to assess the incidence of adjacent segment disease. We present our experience in this field.

**Methods:** All patients admitted to department of neurosurgery, SVIMS, Tirupati, who underwent anterior cervical discectomy and disc arthroplasty fulfilling the inclusion and exclusion criteria were analyzed clinically and radiologically. Patients were evaluated preoperatively and postoperatively by means of neck disability index, visual analog score and radiologically by plain CT topography.

**Results:** A total of 25 patients underwent disc arthroplasty over last 2 years. They included 15 males and 10 females. Mean age was 41.46 yrs. C5/6 was the commonest level that was operated. One patient underwent surgery at 2 levels. There was significant reduction in neck pain, limb pain and NDI postoperatively. The cervical lordosis and functional segmental angle were maintained even after surgery. Range of motion was maintained following the disc replacement. No complications were observed.

**Conclusion:** Cervical disc replacement can be used to restore and maintain mobility and function of the involved cervical spinal segments. The procedure shows decreased surgical morbidity, avoidance of complications from instrumentation or postoperative immobilization and allows an earlier return to the previous level of function.

**RARE CERVICAL SPINE TUMOR**

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The goal of this article is to present clinical and pathological feature of two rare case of spinal cord tumour. A 23 year old female patient presented with paraparisis, whereas 35 year old female with weakness in both upper limb. Both tumours removed totally by microsurgical techniques. First one diagnosed as benign gangliogioma and another on as teratoma.gangliogioma must be consider in differential diagnosis affecting spinal cord. In case of spinal gangliogioma showing no sharp delineation from surrounding tissue, a subtotal removal should be considered to prevent severe neurological deficit.

**OS OMOVERTEBRALE: A RARE COMPLEX BONY ABNORMALITY ASSOCIATED WITH RARE CONGENITAL SHOULDER & SPINE DEFORMITIES AND ITS CLINICAL IMPLICATIONS**

Chirag Solanki, B. Indiradevi

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**Aims & Objectives:** We have discussed here in our largest case series of three cases of this uncommon abnormality called Os Omovertebrale or Omovertebral bone. There are only a few case reports comprising exclusively of this abnormality. We have discussed here the varied clinical presentation, associated abnormalities and management strategies. We also have proposed a classification system for this entity.

**Materials and Methods:** We have analysed three patients with os omovertebrale and their clinical presentation. Patients were thoroughly evaluated clinically and radiologically to diagnose this abnormality and associated abnormalities. Out of three two patients were operated due to neurological deficits attributed to this deformity while one patient was managed expectantly. One patient had upper dorsal location which is not described in literature. Analyzing our patients and other reported cases we have proposed a classification system and its practical application. We have discussed and proposed surgical management issues.

**Conclusion:** Os omovertebrale being a rare abnormality on should be able to evaluate, diagnose and manage when encountered in clinical practice. The classification and clinicoradiological correlation described here can be useful to resolve categorizations and individualized management issues.

**TRAUMATIC SPONDYLOPTOSIS OF SUBAXIAL CERVICAL SPINE**

Dhaval Shukla, Jagathlal G, Dhananjaya Bhat, S Dwarakanath

*NIMHANS*

**Aim/Background:** Traumatic spondylolisthesis of cervical spine is rare. This type of injury represents compressive extension stage 5 (CESS5) and distractive flexion stage 4 (DFS4) of Allen’s classification of cervical spine injuries.

**Materials and Methods:** We present seven cases of cervical spondylolisthesis managed surgically. The age of patient ranged from 24 to 64 years. The levels involved were C6-7 in four cases and C7-D1 in three. One patient did not have neurological deficits, and rest had incomplete spinal cord injury. Findings on CT scan were posterior elements fracture in five cases, and facet locking in 2 cases. MRI findings were disc prolapse in one case, signal changes in cord in four cases, cord contusion in one case, and normal cord in two cases. All patients were initially managed with cervical traction. Preoperative complete reduction could be achieved in three cases, partial reduction in three cases, and non reduction in one case. All patients who had complete reduction before surgery underwent anterior cervical discectomy and fusion. Three patients with partial reduction underwent anterior cervical discectomy. None of these patients showed reduction during surgery. These patients then underwent posterior approach, drilling of facets, reduction, and posterior fusion. They were turned again, and anterior fusion was done. One patient who did not show reduction before surgery underwent posterior approach first, followed by anterior fusion, then posterior fixation. Results: All patients recovered well after surgery. Postoperative imaging showed good
alignment in five patients and poor alignment in two. Conclusion: Cervical spondyloptosis is rare, and management has to be tailored individually.

**VCR FOR THE MANAGEMENT OF SPINAL AILMENTS: IS IT SAFE?**

Pallav Bhatia, Harvinder Singh Chhabra  
*Indian Spinal Injuries Centre*

**Objectives:** The purpose of this study was to evaluate the safety of posterior vertebral column resection (PVCR) procedure.  

**Materials and Methods:** We retrospectively reviewed 125 pediatric and adult patients with spinal diseases who underwent a posterior only VCR between 2008 and 2011. Etiological diagnoses was severe deformity (kyphosis, scoliosis and kyphoscoliosis; idiopathic, congenital, posttraumatic and posttubercular) (n=52), active tuberculosis (n=73). Anteroposterior and lateral radiographs were taken before surgery and at most recent follow up to assess deformity correction, spinal balance, and any evidence of pseudarthrosis. Complications were grouped as major or minor and further stratified as surgical versus medical. Risk factors for complications were also studied.

**Results:** Overall complications in our study was 45.8% while it was 53.3% in lenke study, and 18 to 50% in studies on PSO. We experienced major medical complications in 13.8% in deformity group and 21% in tuberculosis group. Similarly major surgical complications were encountered in 16.6% in deformity group and 6.3% in tuberculosis group while it was 24.8% in study by lenke and 17% in study by suk.

**Conclusions:** PVCR is a technically demanding procedure with possible risk for major complications. The major complication rate of our study was less than that reported in literature and comparable with studies on PSO. Since VCR can achieve better three dimensional correction of deformity, our study justifies the judicious use of PVCR in skilled hands for the treatment of spine deformities with significant sagittal and coronal imbalance and infections which require circumferential decompression and reconstruction.

**SPINAL GANGLIOCYTOMA IN A PATIENT OF ACUTE LYMPHOCYTIC LEUKEMIA: A CASE REPORT**

Nilay Adhvaryu, Mukesh P Patel, Dr K B Shah, Dr Navneet Kumar, Dr Sunil Kumar, Dr Anish Goyel  
*Nh Municipal Medical College, V S Hospital*

Spinal gangliocytoma in a patient of acute lymphocytic leukemia: A case report Abstract We present a case of extradural dorsal spinal gangliocytoma in a 7-year-old boy. The patient is a known case of acute lymphocytic leukemia and undergoing chemotherapy. He presented with local site swelling and pain without any neurological deficit. MRI finding showed large lobulated extradural soft tissue mass involving posterior elements, pedicle and vertebral bodies of D8 to D10 vertebra predominantly on left side with epidural and adjacent soft tissue extension. There was no sign of spinal cord compression or myelopathy. Intraoperatively the tumour was brownish soft to firm capsulated involving the surrounding muscle. Histological examination of the surgical specimen showed gangliocytoma grade WHO grade 1.

**ANEURYSMAL BONE CYST OF SACRUM - A CASE REPORT**


**Aims:** to study and review a rare case of sacral aneyurismal bone cyst-institutional experience  

**Material and method:** Rarely, aneurysmal bone cysts occur in the sacrum. In this location, therapy is limited by lesion's close association with sacral nerve roots and the possibility of resultant neurologic deficit. A 24-year-old boy was referred for a 4-month history of radiating back pain and urinary hesitancy with weakness in both lower limbs. He had problems ambulating because of pain and weakness. Magnetic resonance imaging and CT scanning showed a cystic mass in the sacrum. Treatment options were then discussed with the patient and patient was treated by resection and curettage; Patient had no preoperative embolization.

**Results:** The patient experienced a dramatic decrease in pain and concomitant improvement in function. Clinical and radiographic follow-up obtained at 2, 6, and 18 months after initial treatment revealed the patient to be asymptomatic with progressive ossification

**Conclusion:** Aneurysmal bone cysts of the pelvis and sacrum are usually aggressive lesions associated with substantial bone destruction, pathological fractures, and local recurrence. Rarely, aneurysmal bone cysts occur in the sacrum. In this location, therapy is limited by lesion's close association with sacral nerve roots and the possibility of resultant neurologic deficit. Current management recommendations include preoperative selective arterial embolization, excision-curettage, and bone-grafting.

**MAJOR SPINAL SURGERY PROCEDURE ON A HIGH CARDIOVASCULAR RISK PATIENT WITH SYMPTOMATIC NEURAL COMPRESSION DUE TO 1: OSTEOPOROTIC T12 COMPRESSION FRACTURE ALONG WITH 2: L5/S1 SPONDYLOLISTHESIS - A CASE REPORT**

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**Introduction:** Osteoporotic vertebral fracture most common located at thoracolumbar junction, whereas most spondylolisthesis at L4-5 is six to ten times more frequent involved than adjacent level. Concomitant compressed fracture with lumbar spondylolisthesis is rarely reported.
Aim: To report an unusual case concomitant osteoporotic compressed thoracic fracture with lumbar spondylolisthesis and severe comorbidy.

Case: A 68 years old female complaining 3 months severe low back pain and right thigh pain after falling on the floor. On physical examination she had bilateral foot drop, there was no sensory loss and neither any bowel and bladder involvement with cardiovascular problem 70% left artery coronary obstruction on cardiac angiography.

Investigation: MRI D12 Compression fracture with spinal cord and thecal sac compression and spondylolisthesis L5-S1.

Management: L5 laminectomy, L4/5 and S1 posterior stabilization, D-12 laminectomy and transpedicular vertebroplasty and posterior stabilization of D11–L1.

Result: The pain was significantly reduced after the surgery.

Conclusion: Open surgery among osteoporotic compression fracture in thoracal spine and degenerative spondylolisthesis in lumbar spine need further evaluation regarding comorbid disease which often present in advancing age.

Epidural Dorsolumbar Spinal Metastasis of Choriocarcinoma - A Rare Case Report

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Study Design: A rare case of dorsolumbar epidural metastasis of a choriocarcinoma

Aims: To present and review a rare case of metastatic choriocarcinoma in the dorsolumbar spine.

Methods: A 21-year-old woman presented with complaint of acute sudden onset paraplegia since 15 days with past history of uterine dilatation and curetage before 1 month for abnormal products in uterus and vaginal bleeding and laparotomy for uterine perforation before 20 days. No reports of biopsy available. Dorsolumbar magnetic resonance examinations revealed epidural lesion at the level from D5 to L1 on posterior and Rt lateral side which was hypointense on T1 weighted image, hyperintense on T2 weighted image and shows post contrast enhancement with compression of spinal cord. Contrast enhanced computer tomography of thorax and abdomen showed nodular metastasis of lung with pleural effusion and ascites. Patient was operated for D6 to D9 laminectomy and biopsy from that lesion which was very vascular.

Results: Biopsy report revealed infiltration of invasive hydatidiform mole. Serum level of was 242958 miu/ml. Despite of chemotherapy and radiotherapy patient has paraplegia at present.

Conclusion: We have reported a rare case of dorsolumbar epidural metastasis and pulmonary metastasis of choriocarcinoma. Choriocarcinoma is a highly anaplastic malignancy derived from trophoblastic cells characterized by the secretion of human chorionic gonadotropin (βHCG) and early hematogenous metastasis. However, metastatic choriocarcinoma in the spine is extremely rare. Very few cases of metastasis in lumbar and/or sacral vertebra have been reported. Chemotherapy and radiotherapy is treatment of choice for metastatic choriocarcinoma.

Assessment of Neurological and Radiological Outcome in Traumatic Dorsolumbar Spine Fractures Stabilized by Short Segment Posterior Instrumentation and Posterolateral Bony Fusion

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Aims and Objective: The dorso lumbar (DL) segment (D10 to L2) of the vertebral column is an unstable zone between fixed dorsal and mobile lumbar spine at a junction of dorsal kyphosis and lumbar lordosis. Traumatic injuries to this zone are quite common and can be unstable. The aim of the present study is to evaluate the clinical and radiological outcome in cases of traumatic dorsolumbar spine fractures stabilized with posterior decompression and short segment transpedicular screw and rod fixation with posterolateral bony fusion.

Material and Methods: Patients admitted between June 2011 till Dec 2013 were studied retrospectively and prospectively. 30 patients of traumatic dorsolumbar spine fractures were included in the study. Of 30 patients 19 were male (63%) and 11 were female (34%). Age ranged from 18 to 66 yrs with mean age of 40 yrs. Duration of follow up was from 3 months to 12 months. All underwent posterior decompression and short segment transpedicular screw and rod fixation with posterolateral bony fusion. Neurological assessment was done by using Frankel grading preoperatively postoperatively and on follow up. Fractures were classified using Denis 3 column classification. Radiological outcome was measured by using sagittal index, sagittal ( Cobb’s) angle, anterior and posterior vertebral body compression preoperatively, postreduction and at follow up. Loss of local kyphosis correction for local kyphosis angle were also noted.

Results: Out of 30 patients 10 presented with complete paraplegia (Frankel grade A) of which 7 showed no signs of improvement, 1 improved to grade B and 1 to grade C and 1 to grade E. One patient present with Frankel grade B who improve to grade D. 11 patients present with Frankel grade C out of which 1 remained at grade C, 6 improved to grade D and 4 to grade E. One patient present with Frankel grade D which improved to grade E. 7 patients present with grade E and remained at grade E whereas no neurological deterioration was observed in any case. The most common mode of injury in our study showed 20 cases of fall from height (67%), 7 cases of RTA (23%) and 3 cases of heavy weight fall on back (10%). L1 vertebra was most commonly fractured in 13 cases (43%), D12 in 8 cases (27%), L2 in 5 cases (17%), D11 in 4 cases (13%). According to Denis classification, fracture burst type A.
present in 11 cases (37%), Anterior wedge compression in 9 cases (30%), fracture dislocation in 5 cases (17%), burst type B in 3 cases (10%) and type C in 2 cases (6%). Overall Sagittal alignment significantly improved with sagittal angle from an average of 18.5° preoperatively to 8.6° postoperatively with 10° at follow up. The sagittal index significantly improved from the average of 0.59 preoperatively to 0.70 postoperatively with 0.67 at followup. Loss of kyphotic correction is noted at follow up i.e 2.4° of Cobb's angle loss and 0.03 of sagittal index loss. The anterior and posterior vertebral body height also showed improvement postoperatively. None of the patients showed neurological deterioration. One patient had nut loosening with rod displacement on follow up, revision surgery was done and rod replaced back. Analysis suggests that neurological outcome was significantly better in patients operated upon within 24 hrs of injury.

**Conclusion:** Short term follow up results showed a favorable outcome in the form of improvement in neurological and radiological status in patients of traumatic dorsolumbar spine fractures stabilized with posterior decompression and short segment transpedicular screw and rod fixation with posterolateral bony fusion. However long term follow up evaluation is required to better define the outcome and patient selection. Further studies need to be done to validate the results and to compare the other methods of fixation.

**UNUSUAL COMPLICATIONS OF NEUROINTERVENTION FOR SPINAL A-V FISTULA –MANAGEMENT AND REVIEW OF LITERATURE**

Manish beniwal, sudheesh ramachandra, B.indira Devi

**Object:** Intramedullary spinal AVF and perimedullary AVM require multidisciplinary management, consisting of intervention radiologist and neurosurgeon due to complex angioarchitecture of the lesion and makes the treatment demanding. The complication arising from rupture from the feeding artery with formation of subdural hematoma and extravasated of material can cause progressive neurological deficit due to mechanical compression effect.

**Method:** We report a case of perimedullary AVM with AVF, complicated by vessel injury during catheterisation. Patient presented with progressive paraparesis with spinal AVM with AVF. Digital subtraction angiogram (DSA) confirmed the diagnosis. Underwent spinal angiogram, during the procedure there was difficulty in withdrawing the catheter and immediate extravasation of embolic material and blood was noticed. Procedure was abandoned and post procedure she was conscious, obeying, without any sensorimotor deficits for the next 48 hours and after that developed progressive neurological deficit due to mechanical compression effect. MRI - shows spinal subdural hematoma and intramedullary hematoma, hence patient underwent decompressive laminectomy and decompression of hematoma was done and patient improved in motor power.

**Conclusion:** we suggest that the occlusion of perimedullary AVF/AVM with embolic materials may be associated with higher risk of radicular artery rupture resulting in hematoma or extravasated material causing compression and neurological deficit. We suggest that when scan shows mass effect due to this complication, decompression is useful and should be considered.

**CONCURRENT MILLER FISHER SYNDROME (VARIANT) IN OSSIFICATION OF POSTERIOR LONDONTAL LIGAMENT IN THE CERVICAL SPINE (A CASE REPORT)**

Dr Sudhendoo Babhulkar

**Introduction:** Acute autoimmune pathology may at times be associated with OPLL. High index of suspicion is required to differentiate the two.

**Case Report:** A 56-year-old male presented with four days history of loss of sensation on both lower and upper extremity. The complaint started in left leg, spread to right leg, and then upper extremities rapidly. There was imbalance during walking. Muscles strength in all extremities were normal, but sensory loss was patchy. Deep tendon reflexes were absent in all limbs.

**Investigations:** CT Scan and MRI showed cervical canal stenosis due to OPLL. Nerve Conduction Velocity suggested peripheral neuropathy on both upper and lower extremity. IgG was positive. Cerebro spinal fluid examination showed dissociated citoalbuminuria.

**Treatment:** Patient was treated with a course of immunoglogulin for 5 days.

**Results:** Improvement was seen within 5 days, and progressively return to normal condition in 3 weeks.

**Conclusion:** Guillain–Barré syndrome may be found in patient with OPLL showing obvious compression on the cord.

**BUCKS FUSION FOR A L4 PARS DEFECT**

Dhananjaya I Bhat

NIMHANS, Bangalore

Bucks fusion consists of fixing the pars defect by placing a screw across the defect. This gentleman is a CRPF Jawan who presented with severe dull low back ache with no radicular pain. He was unable to stand for more than 5-10 minutes following which he had to lye down. X ray/CT showed bilateral L4 pars defect with no instability on flexion/extension. MRI revealed no disc prolapse with no neural compression. His preoperative Oswestry disability index(ODI) was 80. He underwent a Bucks fusion uneventfully. On follow up at one year he has recovered well and is able to do his military duty with minimal difficulty. He is able to stand for more than 2 to 3 hours with ease. His postoperative ODI is 20 indicating g marked improvement. CT shows screws insitu, but fusion has not yet taken place. In patients presenting with a pars defect with only low backache with no radicularopathy Bucks fusion is a very good option for excellent outcome.
IMPLICATION OF CONJOINT NERVE ROOTS IN LUMBAR SPINAL SURGERY

Dr Sumeet Pawar, Dr Sudhendoo Babhulkar, Dr P S Ramani
Department of Neuro Spinal Surgery, Lilavati Hospital and Research Center, Mumbai

Introduction: Once in a while, while doing lumbar laminectomy for whatever reason, one finds that the two nerve roots are conjoint. It does interfere with surgical intervention.

Material and Methods: Laminectomy is usually performed for surgical procedures like degenerative lumbar canal stenosis, Cauda equina tumor or developmental anomaly like spinal dysraphism, low lying conus etc. The conjoint nerve root is usually found on one side and the upper nerve root is always migrated downwards. The junction of the two nerve roots usually lies over the intervertebral disc space. Retraction of the nerve root is difficult. Implications: The upper nerve root is usually migrated downwards and it is very tight in the canal. Even the slightest retraction can cause nerve root damage. The junction lies over the intervertebral disc space making it difficult to enter the intervertebral disc space on that side. Foraminotomy should be done to decompress the nerve root. Laminectomy is mandatory and MISS techniques can create confusion and complication.

Conclusion: Conjoint nerve root, although a congenital anomaly, has surgical implications.

IMPLICATIONS OF CONJOINT NERVE ROOTS IN LUMBAR SPINE SURGERY

Dr Sumeet Pawar, Dr Sudhendoo Babhulkar, Dr P S Ramani
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Conclusion: Conjoint nerve root, although a congenital anomaly, has surgical implications.

CONCURRENT MILLER FISHER SYNDROME (VARIANT) IN OSSIFICATION OF POSTERIOR LONGITUDINAL LIGAMENT IN THE CERVICAL SPINE

Sudhendoo Babhulkar
Lilavati Hospital and Research Centre, Mumbai

Introduction: Acute autoimmune pathology may at times be associated with OPLL. High index of suspicion is required to differentiate the two.

Case Report: A 56-year-old male presented with four days history of loss of sensation on both lower and upper extremity. The complaint started in left leg, spread to right leg, and then upper extremities rapidly. There was imbalance during walking. Muscles strength in all extremities were normal, but sensory loss was patchy. Deep tendon reflexes were absent in all limbs.

Investigations: CT Scan and MRI showed cervical canal stenosis due to OPLL. Nerve Conduction Velocity suggested peripheral neuropathy on both upper and lower extremity. IgG was positive. Cerebro spinal fluid examination showed dissociated citoalbuminuria.

Treatment: Patient was treated with a course of immunoglobulin for 5 days.

Results: Improvement was seen within 5 days, and progressively return to normal condition in 3 weeks.

Conclusion: Guillain–Barré syndrome may be found in patient with OPLL showing obvious compression on the cord.

MAJOR SPINAL SURGERY PROCEDURE ON A HIGH CARDIOVASCULAR RISK PATIENT WITH SYMPTOMATIC NEURAL COMPRESSION DUE TO 1: OSTEOPOROTIC T12 COMPRESSION FRACTURE ALONG WITH 2: L5/S1 SPONDYLOLISTHESIS- A CASE REPORT

Sumeet Pawar
Lilavati Hospital and Research Centre, Mumbai

Introduction: Osteoporotic vertebral fracture most common located at thoracolumbar junction, whereas most spondylolisthesis at L4-5 is six to ten times more frequent involved than adjacent level. Concomitant compressed fracture with lumbar spondylolisthesis is rarely reported.

Aim: To report an unusual case concomitant osteoporotic compressed thoracic fracture with lumbar spondylolisthesis and severe comorbidity.

Case: A 68 years old female complaining 3 months severe low back pain and right thigh pain after falling on the floor. On physical examination she had bilateral foot drop, there was no sensory loss and neither any bowel and bladder involvement with cardiovascular problem 70% left artery coronary obstruction on cardiac angiography.

Investigation: MRI D12 Compression fracture with spinal cord and thecal sac compression and spondylolisthesis L5-S1.
Management: L5 laminectomy, L4/5 and S1 posterior stabilization, D-12 laminectomy and transpedicular vertebroplasty and posterior stabilization of D11– L1.

Result: The pain was significantly reduced after the surgery.

Conclusion: Open surgery among osteoporotic compression fracture in thoracic spine and degenerative spondylolisthesis in lumbar spine need further evaluation regarding comorbid disease which often present in advancing age.

USE OF NEW DEVELOPED REDUCTION TYPE SCREWS FOR RIGID POSTERIOR INSTRUMENTED REDUCTION OF ATLANTOAXIAL DISLOCATION AND BASILAR IMPRESSION

Apurv Acharya
Spine Surgeon, Aaditya Spine Hospital, GCS Medical College Hospital, Government Spine Institute

Aims: To access ease, efficacy, safety & stability of use of new developed reduction type screws in pedicles of C2 or lateral mass of C1 for rigid posterior instrumented reduction of basilar impression & atlantoaxial dislocation cases. Clinical and radiological results are also assessed peri-op & at sequential follow up.

Material and methods: Prospective study by single surgeon in total 8 neurologically compromised patients of different etiologies and age from 10 to 58 years including revision surgery situation. Posterior instrumentation done using 3.5mm diameter cancelous thread and reduction type mono axial screws in C2 pedicles for O-C2 construct in case of basilar impression or C1 lateral masses in case of C1 -C2 construct for AP or rotatory AAD. By tightening single inner nut of reduction screws along with reduction maneuver gradual,effective, safe and stable reduction in proper alignment was achieved which was also confirmed under IITV and intra-op neuro-monitoring when available. Decompression as per need and fusion with autologus cancelous chips &/or tricortical bone grafts were added to complete procedure.

Results: No patients needed extension of instrumentation and fusion to mobile C2-3 motion segment for reduction. Immediate post-op all patients extubated by same evening in ICU with same or improved neurology. No patient had vertebral artery complication, post-op infection or neurological deterioration. Gradually all patients improved clinically to get independent in ADL & ambulation. Radiologically on sequential X-rays & CT scan, all showed progression to established posterior fusion in proper alignment & improvement of neurological compression. Minimum 6 weeks to maximum 7 months follow-up results are presented.

Conclusion: As per our prospective study use of reduction type screws are safe, effective and easy to achieve impressive and stable reduction in surgeon and patient friendly manner. Excellent to good short term clinical and radiological results are encouraging. However it needs further long term follow-up in larger series to confirm good long term results and wide acceptance of this method.

SPINAL CORD TUMORS

Kunal Dholakiya
Nhl Mmc, V.S. Hospital

Objective: spinal cord tumor is tumor arising from cord itself and its surrounding meninges.surgery plays key roll in the management, with purpose of obtaining radical tumor resection and at the same time providing best surgical outcome. We retrospectively analyzed 100 patients of spinal cord tumor operated in our institute.

Material and methods: data of 100 patients operated for spinal cord tumor in our institute from 2004 to 2014 has been analyzed for surgical outcome.

Results & Conclusion: best functional results were observed in patients with benign tumor presented in early course of disease with minimum neurological deficits. Worst outcome was observed in pt with malignant tumor presented in late course of disease.

INTRASPINAL TUMORS OUR EXPERIENCE

Chandranath R Tiwari, Vernon Velho, D A Palande
Grant Medical College and Sir J J Group of Hospitals

To analyse 210 cases of Intraspinal tumors treated at Sir J J hospital between 2004 to 2014 and study the relation between the tumor type, location and size with overall outcome. All the patient were clinically evaluated using nuricks grade and radiologically investigated using Xray, CT scan, MRI P+C. Various treatment modalities included surgery, medical treatment, and radiotherapy.

Outcome once analysed showed an obvious reltion of size, location,tumor type with overall outcome.

IMPLICATION OF CONJOINT NERVE ROOTS IN LUMBAR SPINAL SURGERY

Sumeet Pawar, Sudhendoo Babhulkar, P S Ramani
Department of Neuro Spinal Surgery, Lilavati Hospital and Research Center, Mumbai

Introduction: Once in a while, while doing lumbar laminectomy for whatever reason, one finds that the two nerve roots are conjoint. It does interfere with surgical intervention.

Material and Methods: Laminectomy is usually performed for surgical procedures like degenerative lumbar canal stenosis, Cauda equina tumor or developmental anomaly like spinal dysraphism, low lying conus etc. The conjoint nerve root is usually found on one side and the upper nerve root is always migrated downwards. The junction of the two nerve roots usually lies over the intervertebral disc space. Retraction of the nerve root is difficult.

Implications: The upper nerve root is usually migrated downwards and is very tight in the canal. Even the slightest retraction can cause nerve root damage. The junction lies over the intervertebral disc space making it difficult to enter the intervertebral disc space on that side. Foraminotomy should be done to decompress the nerve root. Laminectomy is mandatory and MISS techniques can create confusion and complication.
Conclusion: Conjoint nerve root, although a congenital anomaly, has surgical implications.

EVALUATION OF CERVICAL SPINAL FIXATION CLINICAL TRAINING COURSE FOR YOUNG NEUROSURGEONS AND ITS IMPACT ON SURGICAL OUTCOME

Hossam Ibrahim Maati

Background: Surgical skills are a cornerstone in improvement of surgical outcome.

Aim of the study: This study was conducted to evaluate a clinical training course of cervical spinal fixation (anterior approach) for young neurosurgeons and its impact on their surgical outcome.

Methodology: The study included 14 of young neurosurgeons at Benha faculty of Medicine (7 lecturers and, 7 assistants lecturers). The evaluation items included surgical duration, incidence of complications, and patients improvement and satisfaction. We compared these items during 6 months pre and post implementation of the clinical training course. The course was implemented in 7 days (2 days of lecturers and 5 days of clinical training).

Results: The mean duration of surgery was 150 +/- 18 minutes and 120 +/- 15 minutes in pre and post course respectively. Also, the incidence of complications was 14.8 % and 10% in pre (54 patients) and post (60 patients) course period respectively. Surgical outcome was excellent in 64.8%, good in 22.2 % and fair in 13 % in pre course 6 months, while it became 75%, 16.7%, and 8.3% in post course 6 month. Patient satisfaction improved from 68.5 % (pre course) to 86.7 % (post course).

Conclusion: The study results revealed that the implementation of this training course resulted in improvement of young neurosurgeons clinical skills which reflected on statistically significant improvement of all items of their surgical outcome, and significant decrease in surgical duration.

Key words: Spinal Fixation – Training Course – Surgical Skills

SPINAL DURAL AV FISTULA

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Introduction: Spinal dural AV fistulas are most commonly encountered vascular malformations of the cord. It primarily involves thoracolumbar region of the elderly men. The location of the fistula is generally beneath the duramater (close to the nerve root sleeves) where the radiculomeningeal artery enters a radicular vein. We present two cases of spinal dural AV fistulas. Our first case was a 42year male patient who initially underwent laminectomy for his radicular pain. Later he was referred to our institution as his symptoms worsened. The second case was a 58 year male patient who was primarily diagnosed AV fistula in our institution. Both the cases revealed spinal dural AV fistula in spinal angiography. Subsequently they underwent laminectomy and surgical ligation of the fistula.

Conclusion: Spinal dural AV fistulas are a treatable cause of myelopathy. The history, clinical signs and angiography can accurately point to the diagnosis. Thus early intervention preferably in the form of surgical treatment can reverse most of the neurological deficits.

OPTIMALLY INVASIVE TRANSFASCIAL, TRANSMUSCULAR PEDICLE SCREW FIXATION IN THORACOLUMBAR SPINE

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National Institute of Mental Health and Neurosciences, Bangalore

Aims: Percutaneous transpedicular fixation of the thoracic and lumbar spine is done for spinal fractures and a variety of inflammatory, infectious, degenerative and neoplastic conditions. Compared to the traditional open method of fixation it requires an entirely different set of instruments and implants. We describe an "optimally invasive" transfascial, transmuscular technique of pedicle screw fixation using the standard implants used in routine open pedicle screw fixation.

Materials and Methods: Surgical technique: The skin is incised in the midline as in the traditional open procedure and then lateral fascial incisions are made at the facet regions and as in percutaneous procedures pedicle screw fixation is done. When required a limited subperiosteal muscle dissection and laminectomy was done. Post operative CT scans were done in all patients to look for screw position.

Results and conclusion: This method was used in 15 cases including trauma and infection. There was post operative deterioration in power in any patients. Depending on the preoperative power in the lower limbs the patients were made to walk or mobilized on a wheelchair on the following day of surgery. CT scan showed good screw position in all. This procedure was found to be safe, more than three levels could be fixed and it had the advantages and patient comfort of percutaneous fixation minus the cost.

PRESACRAL SCREW STABILIZATION IN THE MANAGEMENT OF EARLY SPONDYLOLISTHESIS AND DEGENERATIVE DISC DISEASE

Arjun Shetty

Kasturba Hospital, Manipal

AIM: To evaluate the efficacy of a combination of microdiscectomy and posterior lumbar interbody fusion with presacral screw stabilization in the treatment of Grade I and II lumbosacral spondylolisthesis and unstable degenerative disc disease.

METHODS: Twelve patients with symptomatic lumbosacral (L5-S1) instability were offered micro discectomy and interbody fusion using presacral screw stabilization. Patients with history of bowel, bladder dysfunction and local ano-rectal diseases were excluded from this study. Post operatively all patients were evaluated
neurologically and radiologically for screw position, fusion and stability. Oswestry disability index was used to subjectively evaluate all patients.

**RESULTS:** We had nine females and three males with a mean age of 47.33 years (range: 26-68 years). Post-operative assessment revealed three patients to have screw placed in the anterior 1/4th of the 1st sacral body, in rest nine the screws were placed in the posterior 3/4th. At two years follow-up, 8 patients (67%) showed evidence of bridging trabeculae at bone graft site and none of the patients showed evidence of instability or implant failure.

**CONCLUSION:** Pre sacral screw fixation along with micro discectomy and mini posterior lumbar interbody fusion is an effective, minimally invasive surgical option in the management of early lumbosacral spondylolisthesis and unstable degenerative disc disease.

THE “MIDDLE PATH” IN SPINAL TUBERCULOSIS – LESSONS LEARNT

Kiran Chand. V, Rajesh. A
NIMS, HYDERABAD

**Lessons learnt Introduction:** Tuberculosis of the spine is now considered a medical illness with limited surgical intervention. The consensus of management lies in the “middle pathway” shown by ‘Tuli’. However the point of ‘U’ turn is not clearly defined. Aims and objectives To formulate the management plan in patients with Koch’s spine who have shown paradoxical response (imageological deterioration) while on medical management (ATT).

**Materials and methods:** Patients with Koch’s spine who showed imageological deterioration while on medical management with ATT in the Department of Neurosurgery, NIMS (Jan 2013- June 2014).

**Results:** We had 20 patients of Spinal tuberculosis who were planned to be treated with the “middle path”. All patients presented with backache without any neurological deficits. Out of them 7 patients on follow up imaging at 3 months showed radiological worsening without neurological deterioration. We offered surgery by decompression and spinal stabilisation to all the 7 patients. Three of them refused surgery and were managed by biopsy and continuation of ATT thereafter. Surgical stabilization with posterior approaches was done in the other 4 patients. Of the 4 patients operated with pedicle screw fixations, 3 patients had major wound problems that necessitated the need for implant removal. We will be discussing the paradoxical response in spinal tuberculosis and its probable management.

**Conclusions:** The follow up of the patients on antituberculous treatment for spinal tuberculosis be based more on clinical findings than radiological picture.

REDDUCING THE COSTS OF MINIMALLY INVASIVE SPINE SURGERY: AN INITIAL EXPERIENCE

A Rajesh, Pavan Kumar Pelluru, Ashish Kumar
Nizam’s Institute of Medical Sciences, Hyderabad

**Introduction:** Minimally Invasive Spine (MIS) surgery is an upcoming modality of managing multitude of spinal pathologies like Pott’s spine, thoraco-lumbar fractures, metastasis etc. However, in a resource limited country like ours, use of fixation using fenestrated screws (FS) may prove very costly for patients with poor affordability. We here in describe our initial experience and technique of using standard Non-Fenestrated screws (NFS) for trans-pedicular fixation by minimally invasive way to bridge the economic gap.

**Material and Methods:** We treated 7 patients by the NFS-MIS technique. The average blood loss was 50 ml and the mean operating time was 21/2 hrs. All patients were mobilized the next day after confirming the position on X-rays/CT.

**Results:** All 7 patients are doing well in follow up with no complaints of backache or any instability. There were no screw pullouts or pedicle breach. The average cost of a single level fixation by FNS and NFS was Rs 1,30,000/patient and 32,000/patient respectively. The post operative hospital stay was same for both the categories and there were no major complications including wound healing.

**Conclusions:** Trans-pedicular fixation by using NFS for Thoraco-lumbar spinal pathologies is a cost effective extension of MIS surgery. This may extend the benefits to lower socio-economic group people who cannot afford the cost of FNS. Tactile sensation and the feel of the bony architecture form the basis of such instrumentation and may become easily feasible after a certain experience.

SPINAL INTRAMEDULLARY TUMORS: AN ANALYSIS BASED ON 52 CASES

Awadhesh Kumar Jaiswal, Sanjay Behari, Rabi Narayan Sahu, Arun Srivastava, Anant Mehrutra, Sushila Jaiswal
Department of Neurosurgery and Department of Pathology*, Sanjay Gandhi Postgraduate Institute of Medical Sciences, Lucknow-226014, UP, India.

**Introduction:** Spinal intramedullary tumors comprise 4% of central nervous system tumors and 20% of all intraspinal tumors. This study was performed to evaluate the clinical features, histological spectrum, microsurgical techniques and outcome of spinal intramedullary tumors.

**Material and method:** The study was performed by retrospective review of the medical records of the patients of spinal intramedullary tumors operated in our department.

**Results:** 52 patients (41 males and 11 females; age ranged from 18-57 years) with spinal intramedullary tumors were surgically treated at our institution over last 7 years. The mean duration from onset of symptoms to surgery was 12.6 months. Most common symptom was motor dysfunction (90.8%) followed by sensory dysfunction (90%) and sphincteric dysfunction (59%). Most common location of tumor was cervical (23 cases) followed by thoracic (10 cases), cervico-thoracic and conus (6 cases) each, dorso-lumber (5 cases)
MINIMALLY INVASIVE TLIF USING CANNULATED AND FENESTRATED AUGMENTED PEDICLE SCREWS FOR LUMBAR SPONDYLOLISTHESIS IN PATIENTS WITH OSTEOPOROSIS.

Ramesh Chandra V V, Bcm Prasad
Svins Tirupati

Aims: Instrumentation in patients with osteoporosis is challenging as the vertebral bodies are prone to fractures and hardware failure. Bone cement augmented fenestrated pedicle screw fixation is a new procedure for fixation in osteoporotic bone and very few studies are published in literature. Application of minimally invasive techniques to this procedure is a new and challenging concept. Percutaneous TLIF in the management of lumbar spondylolisthesis in patients with osteoporosis using bone cement augmented, cannulated, fenestrated pedicle screws has never been reported. We present our experience in this field.

Material and methods: A consecutive prospective series of 10 osteoporotic patients operated on between May 2012 and May 2013 (7 female, 3 male, mean age 55 years with degenerative spondylolisthesis underwent MIS posterior pedicle arthrodesis with interbody fusion with PMMA cement augmented cannulated, fenestrated pedicle screws. All patients were included in this study based on the results of a DEXA bone mineral density examination showing severe osteoporosis (mean T score -2.6). Patients were evaluated preoperatively and postoperatively by means of Oswestry disability score and radiologically by plain radiography and CT scan performed one day after surgery and 3 months thereafter.

Results: A total of 10 patients were included in the study. Seven females and three males with average age 55 yrs with major symptoms being low back pain, radiating pain to lower limbs and with average T score of -2.6 were studied. All the patients were clinically and radiologically followed and there was significant reduction of pain and had improvement in quality of life. No radiological loosening or pulling out of screws was observed.

Conclusion: Fenestrated pedicle screw fixation with bone cement augmentation in patients with osteoporosis is a safe technique to increase the pullout strength of screws placed in osteoporotic spines. Performing this technique through a percutaneous and/or a minimally invasive approach is a new concept. The safety and efficacy of this technique to prevent the short-time complications associated with fusion surgeries performed in aging populations is confirmed by our study. The ultimate safety of using this technique needs to be confirmed in a larger series with a longer followup period.

ROLE OF VARIOUS MODALITIES OF MANAGEMENT AND THEIR EFFECTIVENESS IN TUBERCULOSIS OF THE DORSAL SPINE: A RETROSPECTIVE ANALYSIS.

Harish Naik, Vernon Velho, Palande, Rahul Tiwari
Grant Medical college and JJ Hospital, Mumbai

Aim: To study the role of various modalities of management and their effectiveness in tuberculosis of the dorsal spine.

Materials and Methods: This Retrospective study was done over a period of 5 years from Jul-2009 to Jun-2014. Fifty four patients were studied. Neurological assessment was carried out using Frankel's grading and outcome analysed with Frankel's grid. The treatment modality was divided into Conservative / Surgical and all patients followed up for a minimum duration of 1 year. The criteria for conservative management was laid down as: No neurological deficit, No evidence of cord compression on MRI and patient not fit for surgery. We opted for surgical treatment in patients with neurologic deficit,Spinal deformity with instability and Clear evidence of cord compression on MRI. The surgical treatment was further divided into Debridement :Antero-lateral (Transthoracicic) or Posterior (laminctomy), Fusion with bone graft, Instrumentation: Antero-lateral: Cage and Plate, Posterior: Sublaminar wiring with Hartshill's Fixation. The Frenkel's grid was analysed based on the comparison of Frenkel's score at admission and after 6 months.

Observation and Results: Out of the 54 patients of dorsal spine tuberculosis studied, 3 patients (56%) were conservatively and 51(94.4%) surgically operated. Eight patients (14.8%) were treated by debridement only, 19 patients by bone graft fusion (35.2%) and 24 (44%) patients treated by instrumentation. Using the above strictly defined parameters of management, our study revealed improved outcome in 48 patients (88.9%), static in 6 patients (11.1%) and deterioration of none. § Recovery, relief of pain and mobilization and hence commencement of work occurred more rapidly in the surgically treated group. The average maximum blood loss (400ml) was by instrumentation, which also took the most time to operate (about 6 hrs for posterior approach).

The average duration for bed rest was 12 weeks for conservative management and 6 weeks for surgical management. The average length of time taken for pain relief was about 9.3 months by conservative management, whereas it took 8.1 mths,7.2 mths and 3.7 mths for debridement, bony fusion and instrumentation respectively. We also recorded an average kyphosis correction of about 16.20 on 6 months follow up.
Conclusion: Kyphosis did not worsen significantly (>3 deg) in any patient and Instrumentation resulted in significant reduction in kyphotic deformity. Neither progression nor reactivation occurred with 12 months of chemotherapy.

INTRAMEDULLARY SPINAL TUBERCULOMA PRESENTING AS A CONUS TUMOR: STUDY OF TWO CASE

Manthan N. Patel, Harshil C. Shah
B. J. Medical College, Ahmedabad, Gujarat.

Aims: Intramedullary spinal tuberculosis is a rare form of central nervous system tuberculosis especially at conus medularis. To report two cases of the primary intramedullary tuberculosis in the conus medullaris with neither a history of contact nor tuberculous infection elsewhere in the body.

Material and methodology: A healthy 18 year male presented with intramedullary space occupying lesion of thoracic spine manifested as lower back ache paraparesis and sphincter dysfunction since 1 month. General examination and chest x-ray was normal. Magnetic resonance imaging showed a heterogeneously enhancing ‘Target sign’ intra-medullary lesion at D12-L1 level. General examination was uneventful. Chest x-ray was normal.

A 7 year old female presented with intramedullary space occupying lesion of thoracic spine manifested as lower back ache paraparesis and sphincter dysfunction since 5 month. General examination and chest x-ray was normal. Magnetic resonance imaging showed a heterogeneously enhancing intra-medullary lesion at D12-L1 level. Patient had weigh loss of 4 kg in 5 months. Complete excision of tumor was performed through D11-L1 laminectomy. Histological examination revealed caseating granuloma with langerhanse giant cells. Post operatively patients were kept on anti tubercular drugs.

Results: Post operatively and with anti tubercular drugs, paraparesis and sphincter dysfunction improved sufficiently for patients to return to their normal activities with nearly a year of follow up.

Conclusion: Intramedullary spinal tuberculomas are rare disease especially at conus (not more than 30 cases reported till today) but they must be considered in differential diagnosis of spinal cord compression in developing country like India and best treatment is anti-tubercular drugs and surgical excision for neurological detoriation.

C1-C2 LATERAL MASS FIXATION FOR ATLANTO-AXIAL DISLOCATION: A REVIEW OF 33 CASES.

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Objective: Management of atlanto-axial dislocation poses a formidable challenge for the treating doctor. Because of the inherent mobility of the cranio-vertebral junction, achieving rigid fixation and fusion of the atlas with axis is difficult. In addition, assessment of reducibility of the dislocation and the need for trans-oral odontoid resection has to be determined.

C1 lateral mass to C2 pedicle/pars fixation with screws and plates/rods, pioneered by Prof Goel, constitutes one of the most rigid methods of stabilising the cranio-vertebral junction, with almost 90-100% fusion rates reported in the literature. However the surgery is technically demanding, with a steep learning curve, especially for a young neurosurgeon. The operative technique with special emphasis on difficulties encountered during the early phase and the means to overcome them is described.

In addition, the importance of C1-C2 facet anatomy in assessing the reducibility of the dislocation and predicting the need for trans-oral odontoid resection is described.

A review of 33 cases of atlanto-axial dislocation treated in the last one year is presented.

Methods and Materials: Out of 33 cases of atlanto-axial dislocation treated in the last one year, 27 were of congenital /unknown aetiology, 4 were due to trauma and 2 cases were tuberculosis in origin.

In addition to MRI of the cranio-vertebral junction, three dimensional CT scan of the cranio-vertebral junction was done to assess the bony anatomy of the region, with special attention to plane of the C1-C2 joint facet surfaces and the size of the lateral mass of atlas.

In 22 patients with normal facet anatomy and adequate size of the lateral mass of atlas, C1 lateral mass to C2 pars screw and rod fixation was done and normal alignment of the odontoid was restored.

In 11 patients occiput to C2 fixation or C1 –C2 fixation on one side and occiput to C2 fixation on other side was done as lateral mass of atlas of one or both side was not large enough to accommodate the screw.

In 6 patients because of the abnormal facet anatomy, adequate reduction of the odontoid to its normal position could not be achieved.

Out of the six, 4 patients underwent trans-oral resection of the odontoid 5-7 days after the first surgery.2 patients refused trans-oral surgery.

Results: 31 cases had good outcome with stabilisation or gradual improvement in neurologic function. Two patients died, one due to post-operative cord oedema on 6th post op day and the second on 7th post-operative day, the cause of which might have been possible vertebral artery occlusion.

Conclusions: C1- lateral mass to C2- pedicle fixation provides the most rigid fixation of the C-V junction. It is associated with good outcomes once the initial learning curve is climbed and the technique is mastered.

The size of the lateral mass of the atlas and orientation of the C1-C2 facetal surfaces in coronal and sagittal plane determines the reducibility of the dislocation and the need for trans-oral odontoidectomy.
DELAYED MANAGEMENT OF COMPLEX SPINAL NEURO-TRAUMA
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Introduction: Trauma to the spine is common in India. Generally, patients are attended immediately. Presentations include a particular region of the spine or a particular aspect of trauma depending on the expertise of the surgeon.

Purpose: Experience over several years and search through the records reveal complex presentations of spinal neuro-trauma managed much later after trauma (delayed). Spine as a whole with delayed management is never discussed.

Presentation: Presented here is a case of trauma in lumbar spine where patient sustained trauma but were managed much later with good results.

Presentation 1: Middle aged person had sustained severe injury with multiple fractures in a road traffic accident including multiple fractures in the spine. Being in the rural area, he was managed conservatively and he lived a compromised life with numbness in the legs, low back pain and weakness. Recently aggravation of symptoms with severe pain compelled him to consult a city doctor. His lumbar spine was scoliotic and unstable with compression of the cauda equina. He was treated with decompression, correction of scoliosis and stabilisation with satisfactory results.

THORACOLUMBAR FRACTURES: THREE COLUMN STABILIZATION THROUGH POSTERIOR ONLY APPROACH
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Introduction: This study reports the possibility of treating thoracolumbar fractures with single stage decompression and three column stabilization through an entirely posterior approach.

Material and Methods: The cases of 15 patients with severe traumatic thoracolumbar fractures/dislocations that were managed with single- stage decompression, reconstruction and three column stabilization using an expandable cage via an entirely posterior approach were included in this study. Data on age, sex, mechanism of injury, neurological status, surgical technique, radiological and clinical outcome were reviewed retrospectively.

Observation: There was no difference between the preoperative and immediate postoperative neurological status of the patients. The average blood loss was 580ml and average operating time was 4 hours thirty minutes. Adequate decompression, fixation and anterior column correction was achieved in all the patients. After a mean follow up period of 21.4 months, no patient complained of local pain and no significant loss of correction or hardware failure was observed.

Conclusion: Our experience proves that single stage posterior approach using pedicle screws and an expandable cage is a safe and biomechanically reliable method for treating thoracolumbar fractures.