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CRAMP FINDINGS: CAN IT BE USED AS A NEW DIAGNOSTIC AND PROGNOSTIC FACTOR IN LUMBAR DISC SURGERY?

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Introduction: The limits of relative indications in lumbar disc surgery are widened with the development of new imaging techniques. The physical examination findings are needed to be more accurate. This prospective study presents the importance of a new finding which was first recognized in 1987 by the senior author (MND).

Methods: With the patient in prone position, the examiner applies a force to the leg to overcome the knee flexion. The finding is positive if a disturbing cramp in the leg or thigh is felt. Group A included 100 healthy people. 100 Group B patients were the ones who admitted for low back pain only. Group C (n: 184) patients were operated for lumbar disc herniations. The study was performed between October 1997-December 1999. The cramp finding was correlated with routine physical examination, MRI, and serum biochemistry results.

Results: The cramp finding was negative in Group A. It was positive in 1.4% of Group B patients.The positive results in Group C were 72% (n: 133) preoperatively. Cramp finding was positive in all contralateral SLR test positive patients (64%) and in all patients with neurological deficits (86%). There was positive relation between the localization of disc protrusion or sequestration in axial plane with the finding. There was no statistical significance of serum biochemistry. The cramp test was positive in 70%, 52%, 34%, and 8% postoperatively in the first, 3rd, 12th and 24th months respectively.

Conclusion: The presented finding seemed valuable as much as the SLR and especially contralateral SLR test. There are positive correlations with radiological studies. Cramp test is also important in prognostic outcome.

THE EFFECT OF TRANSPEDICULAR INTRACORPORAL GRAFTING IN THE TREATMENT THORACOLUMBAR BURST FRACTURES ON CANAL REMODELING

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Purpose: Transpedicular intracorporal grafting in combination with short segment instrumentation has been offered as an alternative to prevent failure. The concern still exists about the potential complication of further canal narrowing or failure of remodeling with this technique. This study prospectively evaluated canal remodeling in patients treated with transpedicular intracorporal grafting.

Patients and methods: Twenty-one patients with thoracolumbar burst fractures were randomized into transpedicular grafting (TPG) (n=11) and non-TPG (NTPG) (n=10) groups and were prospectively followed for an average of 50 months (25-85). Groups were similar for age, type of fracture, load sharing classification and kyphotic deformity. Preoperative, postoperative and follow-up CT images through the level of pedicles were obtained, corrected for differences in magnification, and digitized. Areas of the spinal canals were measured and normalized by the estimated area at that level (average of adjacent levels).

Results: There were no operative complications in any of the groups. Average sagittal index was 19.7±6.2 degrees at presentation, was corrected to 1.9±4.9 degrees by operation, but was found to have been deteriorated to 9.1±6.4 degrees at final follow-up. There were no differences between groups regarding the evolution of sagittal deformity. Spinal canal narrowing was 38.5±18.2% at presentation, 22.1±19.8% postop., and further improved to -2.5±16.7% at follow-up, similar for both groups (Table I).

Canal narrowing	TPa	NT Pa	P-value
Pre-operative	40.5±16.9%	36.1±20.4%	0.601
Postoperative	24.2±20.6%	19.6±20.0%	0.648
Follow-up	0.4±10.9%	-5.4±21.3%	0.476

Discussion: Our results demonstrate that transpedicular intracorporal grafting in the treatment of burst fractures does not affect the rate of reconstruction of the canal area as well as remodeling. Spinal canal remodeling was observed to occur in all patients regardless of grafting eventually leading to over correction in some. On the other hand, it was also seen that this technique is not effective in preventing the deterioration of radiological findings in patients treated with short segment posterior instrumentation.

THE THREE DIMENSIONAL EVOLUTION OF SCOLIOTIC CURVATURE DURING INSTRUMENTATION WITH-OUT FUSION IN IMMATURE PATIENTS

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Purpose: To evaluate the evolution of scoliotic curves until definitive fusion in immature patients that had undergone single rod distraction instrumentation without fusion (SCR).

Patients and methods: Twelve patients who had been followed till definitive fusion were retrospectively evaluated for any changes in the magnitude of their deformities in frontal, sagittal and transverse planes. Average patient age was 5,8±2.4 years at the time of SCR, and 31±1.6 years at definitive surgery. Average follow-up was 5.5±1.9 (2-8,5) years.

Results: it was seen that average number of lengthening operations per patient was 4,6±1,8 (2-7), number of all operations per patient was 7,1±2,6 (4-13). Average number of complications per patient was 1,9±2,2 (0-6). Average time spent in hospital was 104±69 (30-262) days. A summary of results can be seen on Table 1.

Ave±SO(ran.) (°)	Pre-SCR	Pre-def. surg	% change during SCR	Post -def. surg
Frontal Cobb	58.7±12.2 (40-90)	59.6±12.1 (45-78)	7.4±18.8 (27-35)	34±7.7 (22-45)
Apical rotatian	20.2±7,3 (10-35)	33,2±5,2 (25-42)	42.6±18,3 (0-67)	
Thoracic kyph,	30,1±10.7 (10-48)	40,9±9,8 (20-52)	42,8±37,3 (13-100) (25-55)	41.8±10,9
Lumbar lord,	39.7±11,6 (24-65)	47,8±16,3 (18-80)	21,0±39,1 (31-79)	50,3:1:7,1 (40-60)

Average curve flexibility index was 46.7±10 at the time of the index operation. At definitive surgery an average of 3.3±2.7 posterior osteotomies were required so as to obtain any flexibility because of facet ankylosis.

Discussion: Our findings demonstrate that, the curves were essentially unchanged in the frontal plane during the period of lengthenings. The sagittal curves remained mostly within the limits of normal, but there was an alarming increase in rotation.

Definitive surgery following SCR was very complex and required facet ostetomies at multiple levels with a correction rate of 44%. It was concluded that, SCR with a single distraction rod was eftective in preserving the deformity for an average of 5.5 years, but was ineffective in controlling any increases in transverse plane deformity. Taking into consideration the above mentioned disadvantages, we believe that early definitive fusion with a higher rate of deformity correction may provide a better aligned spinal column which may compensate the loss of height as criteria of patient satisfaction.

EFFECTS OF DECORTICATION ON SPINAL FUSION: AN EXPERIMENT AL INVIVO STUDY IN GUINEA PIGS

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Aim of the study: This study was designed ta develop an animal model that stimulates posterior spinal fusion with or without segmental instrumentation and determine the effects of decortication on spinal fusion rate when performed independently and when used together.

Methods: Intramuscular injections of ketamine and xylazine mixture were injected to animals 0.2-0.3 cc as anesthetic agent. Spine exposure was made possible through right side subperiosteal dissection between L2-L6 in all animals. Left side of spine was used as the control group. Animals were divided into three groups. Decortication and autografting were performed to posterior elements in Group 1 (n=10); decortication and instrumentation and autografting in Group 2 (n=10); instrumentation and autografting without decortication in Group 3 (n=10). Drummond-type spinal instrumentation using 1.8 Steinman pin and doubled 26 gauge wire were applied to the right side of L2-L6. Posteroanterior and lateral radiographs were made preoperatively and at 3 and 6 weeks postoperatively. After the animals were killed 6 weeks postoperatively the spines from L2-L6 were harvested en bloc. The fusion mass was evaluated by means of macroscopic evaluation, manuel stress testing, radiological and light microscopic evaluation methods.

Materials: Thirty adult male (1-year old) Guinea pig weighing mean 676 gr were used to create in-vivo experimental models in this study.

Results: Based on segmentary evaluations, 80 % of fusion for Group 1.95 % for 2, and 92.5 % for 3 were obtained. Histologically, in Group 1 and 2 a good incorporation between graft and decorticated area was seen in group 3. without decortication a fibrocartilaginous zone between graft and host bed was seen in most of the specimens. Enchondral ossification was seen all of the specimens with instrumentation.

Significance of findings: In case of a stable instrumentation, no positive impact of decortication is observed for the formation of spinal fusion for this animal model.

Conclusions: For this investigation we developed a posterolateral spinal fusion model. The primary advantages of our model are that it closely replicates the procedure performed in humans and this model also demonstrates the biologic questions relevant to spinal fusion. This study also suggests that when segmental instrumentation is impossible or not advisable decortication is essential.

EXPERIMENTAL SPINAL FUSION WITH BIOABSORBABLE RODS

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Purpose of study: To examine the potential benefits and side effects of SR-polylactide rods in posterior spinal fusion in rabbits.

Significance: The removal of spinal instruments is a major operation, which is necessary particularly in young children. The development of bioabsorbable spinal instrumentation provides an attractive alternative. SR-polylactide had been successfully used for internal fixation of extremities with negligible side effects. The application of bioabsorbable implants may reduce the rate of late implant infections and prevent late biomechanical side effects of stiff metallic implants.

Methods: Sixteen immature rabbits were divided into two groups. Bioabsorbable rods were fixed in eight immature rabbits onto three adjacent laminae with 26-gauge spinous process wires on the right side. In the control group 2.5 mm stainless steel rods were used similarly. Autogenous bone grafts obtained from the iliac crest were placed on the laminae to obtain fusion. All rabbits were killed 12 weeks after surgery. The implantation area was assessed for new bone formation and bony fusion by radiography and histological examination.

Results: Histologically new bone formation was noted in the interlaminar spaces on the right side of all rabbits in both groups. There was no significant difference between bone formation in the SR-polylactide and stainless steel instrumentation groups. No side effect of bioabsorbable material was observed.

Conclusion: The SR-polylactide rod was found to be an effective metallic rod substitute for achieving in situ posterior spinal fusion.

EFFECT OF PREOPERATIVE CHEMOTHERAPY ON THE OUTCOME OF SURGICAL TREATMENT OF VERTEBRAL TUBERCULOSIS RETROSPECTIVE ANALYSIS OF 434 CASES

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Preoperative chemotherapy regimen is a traditional treatment method in the surgical treatment of vertebral tuberculosis. A retrospective analysis of 434 cases of vertebral tuberculosis who were treated surgically between 1975 and 1993, were performed with special reference to the preoperative duration of chemotherapy. 376 cases had four weeks of chemotherapy regimen with isoniasid, rifampin, and ethambutol, and in two of them reactivation of the disease was observed. On the other hand, 58 cases underwent operation for neurologic impairment with 6 to 18 hours of the same chemotherapy regimen and in no case re-activation occurred. These results suggest a shorter duration of chemotherapy may be utilized in all patients undergoing surgical treatment for vertebral tuberculosis, providing a thoroughly debridement, leaving no necrotic or infected tissue behind.

SURGICAL MANAGEMENT OF THE ISOLATED SACRAL BONE TUBERCULOSIS IN HEMOPHILIC PATIENT

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Study design: A rare case is reported of the sacral bone tuberculosis in a hemophilic patient.

Objective: To describe the diagnosis and successfull treatment of a hemophilic patient with sacral bone tuberculosis, with surgical intervention and chemotherapy.

Summary of background data: Tuberculosis infection of the lumbosacral region is uncommon, with few reports in English literature. The isolated involvement of the sacrum is exceedingly rare and may be misdiagnosed as a tumoral or a pseudotumoral lesion in hemophilic patients.

Background: The patient was a 51-year-old man with a sacral spinal tuberculosis. After fracture substitution, the patient was operated through an anterior retroperitoneal approach and a large cold abscess localized at the presacral area was drained and curetted. No problem relating the bleeding disorder occurred, in the postoperative course.

Results: The diagnosis of spinal tuberculosis was confirmed histologically. The patient returned to full function after the surgery. Antituberculosis chemotherapy was administered for nine months, postoperatively. No obvious recurrence of the lesion has been seen for 3 years.

Conclusion: Isolated sacral involvement is very rare in spinal tuberculosis. In endemic and developing countries, spinal tuberculosis should be included in differential diagnosis of the suspected sacral lesions. Adequate substitution therapy should be administered with care in patients with bleeding disorders, undergoing major surgery.

THE USE OF TRANSPEDICUIAR DECANCELLATION OSTEOTOMY IN THE TREATMENT OF VARIOUS SPINAL DEFORMITIES

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Purpose: Transpedicular decancellation osteotomy is used in the correction of various spinal deformities. The purpose of this study is to evaluate transpedieular decancellation osteotomy as the surgical treatment of patients with various spinal deformities.

Materials and methods: Between 1990-1996, 23 consecutive patients with various spinal deformities were treated with transpedicular decancellation osteotomy. A retrospective chart and radiograph review was performed. Pre and post-operative radiographic measurement of regional and global kyphosis and lordosis, balance, apical kyphosis and lordosis was obtained. Patients were divided into three groups: Group 1. 4 patients with scoliosis. Group 2. Six patients with epidural fibrosis secondary to discectomy or laminectomy. Group 3. 13 patients with kyphosis. Patients in this group were evaluated in five subgroups, adult kyphosis (1 patient), congenital kyphosis (2 patients), sequela of Pott's disease (3 patjents), ankylosing spondylitis (4 patients), posttraumatic kyphosis (2 patients).

Results: Average follow-up was 28 months, (Range, 24-50). This study group included 9 males and 14 females with an average age 41 years old, (Range, 23-65). The treatment performed was posterior spinal decancellation osteotomy and posterior spinal fusion in all cases. In scoliosis group the average sagittal plane correction was 41 degrees. In kyphosis group the average correction was 45 degrees and in epidural fibrosis group it was 32 degrees. In epidural fibrosis group the primary aim was to relax stretched dura, not to obtain maximal amount of sagittal plane correction.

Discussion and conclusion: The patient with a fixed sagittal decompensated deformity or a stretched dura due to epidural fibrosis presents a difficult orthopaedic challenge. Transpedicular decancellation osteotomy is an appropriate surgical treatment method for correction of fixed sagittal plane deformities and tor relaxation of stretched dura.

EGG-SHELL TYPE DORSAL WEDGE OSTEOTOMY IN THE TREATMENT OF SYMPTOMS DUE TO PERIDURAL FIBROSIS IN PATIENTS WITH LUMBAR KYPHOSIS

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Study design: Prospective case series. Objeetives: To restore the physiological lordosis of the lumbar spine and to relax the tethered dura due to fibrosis.

Summary of background data: Peridural fibrosis is one of the most important complication of lumbar spine surgery. After disc surgery 12 to 15% of the patients complain about chronic low back pain. We think that peridural fibrosis and lumbar kyphosis together make a tethering effect on dura and cause intractable symptoms.

Methods: We performed egg-shell type dorsal wedge osteotomy in 8 patients with severe back and leg pain. 6 patients with sufficient follow up time were evaluated. Before the treatment all patients had undergone multiple spinal operations. Peridural fibrosis was reported in previous operations of patients. All patients had excision of fibrosis and different types of conservative treatmenf. Patients were resistant to these treatment methods. In the operation, transpedicular decancellation of the vertebral body was done just above segment of epidural fibrosis. Dorsal elements of the vertebral body were excised, then upper and lower vertebral segments compressed to each other by the help of transpedicular screws and hooks. Lumbar lordosis is restored peroperatively. During the compression, relaxation of the dura was also observed.

Results: Lumbar dorsal wedge osteotomy was performed with a mean of 38 degrees (range: 16-44 degrees) kyphotic deformity. Mean correction was 32 degrees (range: 26-34 degrees) closing. After mean 31 months of (24-50 months) follow-up there was significant change in kyphosis angle and there was no recurrence of symptoms. The overall pain and function improved in all patients, and all were satisfied with the results.

Conclusion: Egg-shell type posterior wedge osteotomy is useful in the treatment of pain and functional loss due to peridural fibrosis in patients with lumbar kyphosis.

TUBERCULOSIS OF THE LUMBOSACRAL REGION. LONG- TERM FOLLOW-UP OF PATIENTS TREATED BY CHEMOTHERAPY, TRANSPEDICULAR DRAINAGE, POSTERIOR INSTRUMENTATION AND FUSION

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Purpose of study: To prove the hypothesis that transpedicular drainage and single stage posterior instrumentation-fusion is enough for the prevention of lumbar kyphosis in selected cases.

Materials and Methods: Of a total of 55 patients with the diagnosis of spinal tuberculosis, 3 patients had involvement of lumbosacral region. Follow-up period was averaged 63 months (range: 36-97 months). There were 2 male and 1 female and average age was 58 years (range 34-74 years). The following data were studied in these patients: most commonly involved vertebrae, vertebral body loss, progress of the angle of kyphosis.

Results: The fourth lumbar vertebrae was the most common vertebral segment involved, and the lumbosacral junction was affected in all 3 patients. The average preoperative kyphosis was 15.3 degrees and decreased to 4.3 degrees postoperatively. Change in kyphotic angle was not significant at last follow-up. There was no recurrence of infection.

Discussion: In tuberculosis of the lumbosacral region, anterior debridement and fusion with a strut graft can reduce the incidence and size of kyphosis, but is technically demanding. In young patients continued growth of posterior parts of the vertebrae is an additional factor for progressive kyphosis formation. Posterior fusion and instrumentation also prevents this growth resulting in progressive kyphosis.

Conclusion: It is considered that transpedicular drainage and posterior instrumentation-fusion is a less demanding operative technique for lumbosacral tuberculosis for the prevention of lumbar kyphosis in selected cases.

LATE AND EARLY ONSET INFECTIONS IN SPINAL SURGERY

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The treatment methods for early or late developing infections following spinal surgeries with instrumentation have not been completely elucidated. The purpose of this study is to determine the rate and the treatment methods of early and late onset post-operative infection in spinal surgeries. A retrospective evaluation of 458 patients undergoing spinal surgeries with instrumentation between 1993 and 1998 was done. Patients with established infections prior to index operation were not taken to the study. Infection was considered as late-onset when the duration between the operation and the diagnosis of infection was more than one year. There were 17 (3.7%) post-operative infections. Posterior spinal instrumentation was used in 14 (82%) patients, and anterior spinal instrumentation was used in 3 (18%) patients. Late-onset infection was seen in 6 patients. In 2 (33%) patients with late-onset infection, microbiological cultures were negative, whereas in 1 (9%) patient with earlyonset infection, no microorganism was cultured. Antibiotic regimen for the first operation was the same for every patient (First generation cephalosporin prior to and 3 days after the operation). Specific antibiotics were administered after the isolation of the microorganism. Three patients with late-onset infections, implants were removed. In patients with early-onset infections, implants were not removed in 3 patients. All patients with lateonset infections were managed with one surgical debridement, whereas, patients with early-onset infections required an average of 2.5 surgical debridement operations. Lateonset infections following spinal surgeries can be managed with implant removal, whereas for treatment of early-onset infections, more operations may be required.

NEUROLOGICALLY INTACT FRACTURE-DISLOCATION OF THE THORACOLUMBAR SPINE: REPORT OF 10 CASES

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Study design: Ten patients with neurologically intact thoracolumbar fracture-dislocations were studied retrospectively.

Objective: To assess the postoperative results for this type of fracture-dislocations.

Summary of background data: Fracture-dislocations of the thoracolumbar spine are mechanically unstable translational injuries and it is unusual for them to occur without any neurologic deficit. In the literature, neurologically intact thoracolumbar fracture-dislocations are presented as case reports or short series.

Methods: Between 1987-1996, ten thoracolumbar fracture-dislocations were treated. The mean age of the patients was 42 years (range 28-59 years). Level of injury was thoracolumbar junction (Th11- L2) in 4 patients, lumbosacral junction (L5-S1) in 1 patient, lumbar region (L2-3) in 2 patients and thoracal region (Th6-9) in three patients. There were 8 bilateral and 1 unilateral facet dislocations. In three patients neural arc was in its anatomic position while anterior elements translated. Four of the patients did not accept surgical treatment and had a conservative follow-up and the remaining 6 were treated surgically.

Results: The average follow-up was 34 (range 30-48) months. In the last examination operated group had no deterioration in their neurologic status and roentgenograms revealed no serious loss of reduction and solid fusion was observed. In the conservative group, all patients had varying degrees of pain, but they were all intact neurologically. Radiographically, the percent of translation was found to be decreased. However AP and lateral plane deformities were increased.

Conclusion: We obtained better results in surgically treated spinal fracture-dislocations in a small group of our patients. Even if there has been no neurological impairment during mid-term follow-up, mechanical instability may result in the long-term and we believe early open reduction and stabilization should be the way of treatment in these cases.

INSTRUMENTED ANTERIOR DEBRIDEMENT AND ARTHRODESIS OF THE SPINE TUBERCULOSIS

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Fifty-five patients who had tuberculosis of the spine that was treated by debridement and instrumented anterior fusion were reviewed for four years or more postoperatively. Our indications for operation were neurological impairment, mechanical instability and/or existing huge abscess. Eighty-seven per cent of neurologic impaired patients recovered normal neurologic function after anterior decompression and drainage of the abscess. Follow up, there were no findings about reinfection in these patients. The results show that anterior debridement and instrumented fusion with chemotherapy at least nine months were successful the treatment of the spinal tuberculosis.

DEVELOPMENT AND VALIDATION OF AN ISTANBUL LOW BACK PAIN DISABILITY INDEX (ILBPDI)

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Objective: To develop and to assess the validity of a functional disability scale for low back pain (LBP) in a Turkish population.

Methods: In and outpatients with LBP for at least 3 months were selected randomly. Patients with inflammatory LBP were excluded. Interrater reliability and internal consistency (Cronbach's) were examined. Face, content validities were investigated. Convergent validity was assessed by correlating ILBPDI with other functional LBP scales (Ouebec Back Pain Oisability Seale, QBPDS; Oswestry Oisability Index, ODI; Waddell's Functional Index, WFI). Oivergent validity was assessed by correlating ILBPDI with variables known to have a moderate or no relation with functional disability. Factor Analysis followed by varimax rotation was performed.

Results: 112 patients (71 female) with mean age 39.93 (±12.92) were recruited. The provisional scale had 66 questions. The elimination process left 18 daily activity questions. The interrater reliability was 0.79 and Cronbach's alpha was 0.90. The ILBPDI had good convergence with the QBPDS (r: 0.82), the 001 (r: 0.76), WFL (1:0.68). The ILBPDI had either fair or non significant relation (divergence) with V AS-Iumbar, VAS-radicular, Beek Depression Inventory, morning stiffness, night pain, finger-floor distance, radicular pain's duration, modified Schöber's index and other non functional parameters. The ILBPDI had 2 main factors by factor analysis. First factor contained II questions on activities implicating forward bending and the second factor contained 7 questions on standing activities.

Conclusion: We have developed a reliable, accurate and practical functional disability scale for LBP which has been validated in a Turkish population.

CROSS CULTURAL VALIDATION OF THE REVISED OSWESTRY PAIN QUESTIONNAIRE (ROPQ) IN A TURKISH POPULATION

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Objective: To cross-culturally adapt and to validate the Turkish version of the Revised Oswestry Pain Questionnaire (ROPQ) to suit the needs of Turkish speaking patients.

Methods: Out and inpatients with low back pain (LBP) for at least 3 months were selected randomly. The inflammatory LBP was in the exclusion criteria The ROPQ was modified in the context of Turkish culture and translated into Turkish with "back translation method". Internal consistency (Cronbach) and interrater reliability of the scale were examined. Convergent validity was assessed by correlating ROPQ (Pearson's Correlation Coefficient: r) with other functional LBP scales (Istanbul Low Back Pain Disability Index: ILBIDDI; Quebec Back Pain Disability Seale: QBPDS; Waddell's FunctionallIndex: WFL and Visual Analog Seale of Handicap: V ASHd). Divergent validity was assessed by correlating ROPQ with variables known to have a moderate or no relation with functional disability.

Results: 132 patients (85 female) with mean age 41.70 (±14.01) were recruited. Cronbach was 0.80 and interrater reliability (ICC) was 0.74. High convergence was found between ROPQ and other functional LBP scales-(ILBPDI, r: 0.78, p<0.00001; QBPDS, r: 0.79, p<0.00001; WFI, r: 0.70, p<0.00001; VASHd, 0.53, p< 0.00001). The ROPQ had no significant or fair relation (divergence) with age, morning stiffness, night pain, finger-floor distance, radicular pain's duration, VAS-lumbar and Schöber's index. There was moderate relation with VAS-radicular (r: 0.46), and the Beck Depression Inventory (r: 0.40).

Conclusion: The Turkish version of the ROPQ is reliable and valid instrument for studies measuring functional disability and functional handicap due to the LBP.

SURGICAL TREATMENT OF LUMBAR HYPERLORDOSIS IN SPINA BIFIDA PATIENTS

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Objective: Lumbar hyperlordosis produces a nonphysiological flexion posture and interferes with sitting and standing balance in children with spina bifida. This occurs mostly secondary to untreated hip flexion contracture in high lumbar involvement. The objective of this study was to present the results of surgical intervention followed by a short period of intensive rehabilitation on the sitting balance, ambulation status and lordosis angles.

Design/setting: This was a prospective study in a series of 3 cases taken from the 314 patient cohort of Marmara University School of Medicine Spina Bifida Clinic.

Materials/methods: We operated on three patients between the ages of 10 and 16. The preoperative lordosis angles were 140, 110 and 100 degrees. Single stage posterior spinal instrumentation and correction was applied with extensive release of facet joints, interspinous and interlaminar ligaments. A TLSO was used for three to four months. The follow-up period was between 12-24 months.

Results: The postoperative lordosis angles were reduced to 80, 60 and 60 degrees respectively. In the two ambulatory cases extensive soft tissue release and proximal femoral osteotomy were needed to correct the hip flexion contracture. One of the patients regained sitting balance and was able to use her wheelchair while two others were able to walk using high braces af ter a period of intensive rehabilitation.

Conclusion: Single stage posterior extensive release and spinal instrumentation provides satisfactory correction of the lordosis and when coupled with procedures to relieve hip flexi on contractures satisfactory ambulatory status may be obtained.

KYPHECTOMY AND STABILIZATION WITH VERTEBRAL SCREWS IN SPINA BIFIDA

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Objective: Lumbar kyphosis is among the most important problems in spina bifida patients. These children experience problems with sitting and standing balance along with decubiti at the apex of the deformity. Historically these problems were addressed by kyphectomy and rod-wire techniques which required long segment instrumentation. Beyond the perioperative problems caused by a long incision, these children face a nonphysiological short thoracolumbar spine because of the long segment instrumentation and fusion at a young age. In this study, we tried to overcome these problems by applying short segment fusion with the aid of vertebral screws.

Design/setting: This was a prospective study in a series of 6 cases chosen from the 332 patient cohort of our Spina Bifida Clinic.

Materials-Methods: We operated on six patients with thoracic spina bifida between the ages of three and seven with a combination of pediatric sized vertebral screws, rods or plates, wires and transvers connectors. The mean preoperative kyphosis angle was 105 degrees (80°-130°). In all patients relatively short segment instrumentation (average 4,8) was applied with satisfactory correction. Cast application was limited to two months. The follow-up period was between 32 -18 months.

Results: The mean postoperative kyphosis was 14 degrees (0°-32°), loss of correction was negligible but in one case (30 degrees). Implant loosening at the cephalic side was revised in this case. Skin slough which healed with prolonged wound care was encountered in two patients in spite of the low profile screw-plate assembly. Sitting balance was obtained and the occurrence of apical decubiti was prevented in all patients.

Conclusion: The application of vertebral screws in the reconstruction of the kyphotic spine is technically easy and provides more reliable fixation than wires and hooks. Furthermore short segment fusion may avoid the development of a short spine on long term but the risk of recurrence of the kyphotic deformity may remain.

SINGLE STAGE POSTERIOR VERTEBRECTOMY IN YOUNG CHILDREN FOR THE TREATMENT OF CONGENITAL KYPHOSIS AND SCOLIOSIS

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Purpose: To develop an efficient technique for the correction of congenital kyphosis and scoliosis.

Significance: Historically the treatment for congenital spinal deformities consisted of observation, posterior or anterior fusion in situ and combinations of these. Two stage (anterior and posterior) hemivertebrectomy has become more popular in the last decades because this operation provides an acute correction of the deformity. Unfortunately this procedure has a high complication rate and is extremely difficult in certain segments. A single stage posterior approach will achieve the same correction avoiding complications of anterior surgery in young children.

Methods: We have performed the Eggshell subtotal vertebrectomy in four patients with congenital deformities. The patients ages were (4, 5, 5 and 6), two patients had a congenital kyphosis (one Type I at T5-6, the other Type II at T12), the third and fourth patients had a fully segmented hemivertebra at L1 and a semisegmented hemivertebra at T12 respectively. In all patients the vertebrectomy was completed with a standart posterior approach, a novel compressive posterior instrumentation with rods and wires was applied to produce and maintain correction. A short segment (one level above one below) posterior fusion was performed. Perioperative transfusion requirements were 250 and 500 ml (375 average). The duration of the operation was between 160 and 300 minutes (215 min. average). All patients were followed up with a fulltime TLSO for two months, day only bracing was prescribed till the end of the sixth month.

Results: The average correction of the scoliotic and kyphotic curves was 38 degrees. In one case a minor ulcus at the end of a rod healed without further complications. The follow-up period was between 18 and 25 months (20.4 mo average). There was no considerable loss of correction at the last controls.

Conclusion: We presume that single stage posterior vertebrectomy can be applied to a wide spectrum of congenital spine deformities to obtain correction and stability in young ages.

IS ANTERIOR RELEASE IN ADOLESCENT IDIOPATHIC SCOLIOSIS (AIS) EFFECTIVE FOR ENHANCING THE RATES OF CORRECTION OF THE THORACIC CURVE IN ALL THREE PLANES?

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Purpose: To evaluate the effectiveness of anterior release/fusion operations on enhancing the rates of surgical correction and preserving the obtained correction in frontal, sagittal and transverse planes.

Patients and methods: Forty-one patients operated for AIS were evaluated prospectively with pre and post-operative and follow-up standing X-rays and CT rotation measurements. Seventeen of these had undergone anterior release (A+PF) and fusion along with posterior fusion (PF) and segmental instrumentation because of curve rigidity or immaturity. Average patient age at the time of operation was 14.5±2.0 years, and average follow-up was 47.1±21.8 (24-96) years. Patients were evaluated for corrections obtained in frontal and transverse planes, changes in sagittal plane, and the rates of preservation of correction in A+PF and PF groups.

Results: Average pre-operative frontal Cobb angle was found to be 57.0±14.0 deg, thoracic kyphosis 32.8±22.7 deg, and apical rotation 15.7±8.8 deg, were corrected/changed to 20.1±10:6 deg, 37.5±10.8 deg and 16.4±8.3 deg post-operatively and progressed to 23.9±10.7 deg, 41.3±12.7 deg and 16.6±10.6 deg at follow-up respectively. Curve flexibility was 44.7±22.5% in PF and 30.9±19.9% in A+PF groups (p=0.29).Rates of correction by groups, analyzed using ANOVA with curve flexibility as a co-factor, and correction loss (t-test) were as follows.

	A+PF	PF	P-value
Coronal correction (%)	64.6±17.7	65.2±12.6	0.000
Coronal corr. loss (%)	6. 7±1 0.6	7.2±10.7	0.214
Change in kyphosis (%)	35.5±63.8	-33.0±19L4	0.292
Ap. rot. correction (%)	-18.3±26.8	64.9±234.7	0.534
Ap. rot. corr. Loss (%)	86.8±198.7	12.5±34.6	0.164

Discussion: Our results demonstrate that, the addition of anterior release to posterior fusion and instrumentation appears to be effective in achieving a substantial rate of coronal deformity correction in rigid curves. Any effects on thoracic kyphosis as well as the rotational deformity could not be demonstrated even when curve flexibility was taken into consideration. Furthermore, anterior fusion does not seem to be effective for preventing correction losses during followup period.

CASE REPORT: HYDATID BONE DISEASE OF THE THORACAL SPINE

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Hydatid disease due to Echinococcus Granulosus involves bone in about 1 % of all cases. The spine is involved in about 50% of cases. Neural compression is common in the form of paraplegia of nerve. The prognosis with spinal involvement is generally regarded as very poor and often similar to that of spinal cancer. A 49-year-old man was admitted in March 1997 in our clinic. He had progressive back pain, weakness in both legs and had developed parasthesiae and loss of proprioception several months previously. Radiographs, CT scans and MRI demonstrated destruction of the vertebral bodies of the fourth to sixth thoracal vertebrae. Extension into the spinal canal and neural arches posteriorly as well as formation of a mass anteriorly was observed. He was treated for one month with Albendazole (10mg/kg) prior to surgery. Posterior instrumentation was performed first One-week later anterior decompression and grafting by allograft fibula was done by thoracotomy. Total neurological recovery was observed postoperatively. 49 months later, recurrence was detected on MRI. Second thoracotomy and decompression was performed and CT guided needle aspiration and hypersaline serum injected to the residual cyst. Again Albendazole (10mg/kg) was given for six months. He was asymptomatic and able to his work of two years follow-up.

TUBERCULOSIS OF LUMBOSACRAL REGION

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Introduction: Vertebral tuberculosis is the most common form of skeletal tuberculosis. Thoracal and thoracolumbar localizations are more common. Involvement of lumbosacral region is rare, and there are few studies in English literature. Granulomatous infection affects inferior part of L5 corpus, disc and sacral dome. Loosening of intervertebral height and bone destruction causes lumbosacral kyphosis.

Aim of the study: The present study was designed to evaluate the outcome and complications in 6 consecutive patients with lumbosacral tuberculosis treated surgically by anterior transabdominal approach.

Patients: Of total of 188 patients with spinal tuberculosis, 6 patients had involvement of lumbosacral (L5-S1) region. There were 4 women and 2 men. The average age was 52.5 years (from 26 to 70). The main symptom was back pain. Two patients had additional radiculopathy. Anterior debridement and anterior fusion with autogenous bone graft by transabdominal approach were performed for all patients. In two patients, posterior transpedicular screw fixation were added.

Results: Average follow-up was 42.3 months (range 18-80 months). All patients but one have been improved in back and leg pain. Interbody bony fusion were achieved in all patients. Average 8.5 degrees corrections (from O to 20) were gained in lumbosacral angle. We experienced no major complications such as ileus, deep wound infection, phlebitis, sexual problem or neurological impairment.

Conclusion: Lumbosacral tuberculosis of the spine is rare. The incidence of this localization is 3.1 % in our series. Anterior debridement and fusion can reduces the incidence of lumbosacral kyphosis with low rate of complications.

THE COMPARISON OF THE EFFECTS OF TRAMADOL AND MORPHINE IN OPERATIVE TREATMENT OF THORACOLUMBAR FRACTURES OF THE SPINE

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Introduction: We compared the effectiveness and side effects of patientcontrolled analgesia (PCA) with tramadol and morphine for postoperative analgesia in operative treatment of thoracolumbar fractures of the spine.

Methods: After a standardized general anesthesia, 36 patients aged between 20-65 with unstable fractures of the thoracolumbar spine were treated operatively with posterior instrumentation and randomly assigned into two groups. Group 1 (n=18) received intravenous (IV) PCA with tramadol (50mg loading dose, 20 mg bolus, 7min lock-out time). Group II (n=18) received IV PCA with morphine (3 mg loading dose, 1 mg bolus dose, 7 min lock-out time). Pain score (Visual analog scale) and side effects were assessed at O, 6, 12,24,48 hours.

Results: Demographic characteristics were similar between groups. There was obvious reduction in VAS scores in both groups. AIthough no side effects was seen in 5 patients, nausea in 13, vomiting in 5, sweating in 3, dizziness 4, dry mouth in 4 patients were noted in Group I. There were no side effects in 8 patients of the Group II. But nausea in 7, vomiting in 2, dizziness in 3, dry mouth in 3, itching in 1 patients were noted in Group II. Nausea and vomiting significantly decreased in Group II.

Conclusion: In conclusion, tramadol and morphine are effective and safe analgesics for LV PCA following operative treatment of thoracolumbar fractures of the spine. Morphine is well tolerated where as tramadol necessitates concomitant use of antiemetics because of the associated high incidence of nausea-vomiting.

THE COURSE OF NON-SURGICAL MANAGEMENT OF BURST FRACTURES WITH INTACT POSTERIOR LIGAMENTOUS COMPLEX (PIC): AN MRI STUDY

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Purpose: A prospective study to evaluate the results of nonsurgical treatment of burst fractures with intact PLC and to investigate the effect of trauma and/or residual kyphotic deformity on adjacent and neighboring (nextadjacent) discs.

Material and Methods: Fifteen consecutive neurologically intact patients with burst fractures (TII-L2) were managed nonoperatively with the indication based solely on the integrity of PLC determined by MRI. Correction of deformity and stabilization with a total body cast undersedation were the mainstays of treatment. Patients were mobilized the next day and casts were removed at the end of the 3rd month f/up with no further external stabilization. Local kyphosis (LK), sagittal index (SI) and percent of compression of body height (ABH) were measured on pre-treatment, post-treatment, 3rd month and latest f/up x-rays. All patients' preoperative and latest f/up MRI studies were analyzed to examine discs adjacent to and neighboring the fractured levels. Patients' perception of function, pain and appearance were analyzed using Likert Questionnaire.

Results: There were 8 female and 7 male patients with an average age of 28 (range 15-49) years. Average f/up was 31 (24-51) months. Twelve patients had Denis type B while 3 had type A fractures.

Table I. The results of x-ray analysis

	Pre-treatment	Post-treatment	3rd month f/up	Latest f/up
LK (O)	16.5 (0-34)	5 (-19-25)	14.6 (4-24)	18 (4-29)
Si (O)	18 (0-27)	10 (-2-21)	15.6 (-2-23)	19 (4-34)
ABH(%)	30 (5-57)	19 (3-36)	28 (10-52)	39 (12-60)

Pre-treatment MRI analysis revealed changes in the shape of the discs (narrowing or herniation into the body) with no change in the signal intensity of nucleus pulposus(NP) in 8 of the cranial and in 5 of the caudal adjacent discs. On follow-up MRI, there was only one intact disc with abnormal shape cranially. All others had height loss but only one had complete loss of signal intensity. Caudally, 4 additional discs had changes in shape without any gross changes in signal intensity, of NP. None of the neighboring discs had changes in shape or signal intensity at the time of injury or at latest f/up. Average score of function, pain and appearance were 4, 4 and 3.5 respectively at the latest f/up. All patients returned to original work at 3.6 (range 1-9) months on average and all were satisfied with their treatment.

Discussion: Conservative treatment based on integrity of PLC is controversial, probably due to poor evaluation by clinical and indirect radiographic findings. Degenerative changes in the adjacent discs due to trauma and/or residual kyphotic deformity is a common expectation. Our study revealed that an intact PLC may not prevent loss of correction gained by non-surgical management of burst fractures. Significant loss occurs in the first 3 months despite external stabilization. However, the magnitude of residual deformity usually remains close to the original deformity. Although changes in the shape of adjacent discs occur due to trauma and/or natural course, significant loss in signal intensity of nucleus pulposus is very unlikely. Patient outcome seems to be highly satisfactory despite residual deformity.

THE RESIDUAL ROTATION AND TILT OF THE LOWEST INSTRUMENTED LEVEL (LIV) IN POSTERIOR INSTRUMENTATION FOR ADOLESCENT IDIOPATHIC SCOLIOSIS (AIS). ARE THEY REALLY IMPORTANT?

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Purpose: Posterior instrumentation for AIS is usually extended down to the least rotated (neutral) because of the possibility of decompensation. This study aimed to clarify the relationship between the residual rotation and coronal plane tilt of the lowest instrumented level and the frontal, sagittal and transwerse plane parameters of imbalance.

Patients and Methods: Forty-seven AIS patients (average 14,5±1,9) treated with posterior translation instrumtentation were included. Average f/up was 49,6±20,5 (24-96) months. PA and lat. X-rays obtained pre- and post-operatively and at latest f/up visits were measured for frontal and sagittal curve magnitudes, AP tilt and offset of TI, sag. offset of TI, rotation of the level below LIV and shoulder balance (coracoid process height). In thirty patients, additional rotation measurements of 10 landmark levels (inc. TI, inteclavicular bisect (ICB), upper end of inst. (UIV), apices, LI V, level below LIV(LBLIV) and L4) were measured by CT pre- and postoperatively, at 6 and 12 months, and normalized by the rotation of pelvis.

Results: The thoracic curves measured 57,4±13,6 deg pre-, 19,4±9,4 deg postoperatively (66,4±13,6% correction) and 22,2±11,9 deg at latest f/up. LIV was at TI2 in 5, LI in 11, L2 in 14, L3 in 14 and L4 in 3 cases. Rotation immediately below these levels as measured by the Perdriolle method was 8,8±6,2 (0-25) deg pre-, 9,1±6,4 (0-30) deg postoperatively (11,5% increase) and 10,0±7,6 (0-30) deg at latest f/up, the corresponding coronal tilts were 15,5±8,0 deg, 5,4±4,3 deg, and 9,7±9,9 deg respectively. The magnitude of neither significantly affected the TI tilt, AP and sag. TI off-set and shoulder balance. Likewise, the CT measurements of rotation revealed thatt residual rotation at the vicinity of LIV was not associated with a rotational imbalance (Table 1).

Rotation (deg)	LBLIV	LIV	T1	ICB
Pre-op	9.2±6.2	1 OA :t 7.5	5.6±4A	4.3±4.2
Post-op	9.6±5.5	9.6 :t 5.7	4.1±4.7	6.1±4A
6 mos.	10.3±5.5	12A:t6.7	3.3±3.2	2.3±3.3
12 mos.	9A±5.0	10.0±7.0	3.5±2A	3A±2A

Conclusion: The residual angular deformity at the level of the lower end of posterior translation instrumentation for AIS could not be demonstrated to have any effect on the overall postoperative balance of the spinal column in any of the planes.

SEQUENTIAL-SIMULTANEOUS RECONSTRUCTION OF SAGITTAL PLANE DEFORMITIES OF THE THORACOLUMBAR SPINE

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Introduction: The purpose of this study is to present the results of a technique designed to address the technical difficulties associated with combined anterior and posterior procedures performed for kyphotic deformities either in a simultaneous or sequential way.

Methods: Seventeen of 21 consecutive patients with more than two years of follow-up (average 45.3 months; range 24-95 months) were available for study. Three patients were doing well when lost to follow up at less than two years post operative and one patient had died of metastatic breast cancer. There were 7 female and 10 male patients with an average age of 32 years 4 months (range, 14-65 years). Ten had post-traumatic kyphosis, two postlaminectomy kyphosis, two Scheuermann's (one-salvage and one primary), and one each were achondroplasia, spondyloepiphyseal dysplasia, and idiopathic scoliosis salvage. Twelve (71 %) had an average of 1.9 (range, 1-6 procedures) surgical procedures previously. The indications in all cases were pain and/or deformity. The patients preoperative, postoperative and follow-up x-rays in addition to clinical outcome studies were analyzed.

Surgical technique: While positioned prone on a four poster frame osteotomy(ies) and/or decompression(s) were done followed by posterior anchor placement, development of an upper or lower cantilever foundation, and preliminary capture of the rod screw connectors. The skin is temporarily closed 7 and covered with three vidrapes. The patient is turned into the lateral decubitis position and anterior exposure obtained. At the completion of anterior release, the posterior incision is opened and cantilever reduction of the deformity is completed. Structural graft material is placed and compressed.

Results: The mean preoperative 43° angle of sagittal plane deformity was improved to 6°. The average blood loss was 1948 cc (750-4000), operation length 645 minutes (390 to 855 minutes), and hospitalization 8 days (5-17). The mean correction loss at follow-up was 1.8 degree. The overall pain, function and appearance scale (5 worst, 15 best) improved from 7 to 11 ($p = 0.006$) (paired t test) and 15 of the patients were satisfied or very satisfied with the results. There was one deep infection, in a patient who had had previous deep wound infection, one pseudoarthrosis and one junctional kyphosis. All the pattents with complications were successfully treated by additional operations. There were no screw misplacement, graft dislodgement and neurological complications.

Conclusions: The sequential-simultaneous approach for the correction of severe kyphosis is an effective and safe procedure enabling control of all three columns of the spine at the same time. It has the advantages of easier and safer posterior osteotomies and instrumentation when compared with simultaneous approach.

RISK FACTORS OF POSTOPERATIVE DEEP WOUND INFECTIONS IN SPINAL INSTRUMENTATION

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Aim: Postoperative deep wound infection is a major and devastating complication of spinal instrumentation. The aim of this study is to determine and evaluate the risk factors of postoperative deep wound infections in spinal instrumentation.

Materials and Methods: The study group includes 29 deep wound infection cases and age, sex, etiology matched 92 control cases among 869 cases with spinal instrumentation between 1989 and 2000. Cases were also grouped as early and late onset infection cases and their matched control groups Recorded variables were age, sex, etiology, body mass index, year, duration and type of operation, implant material, number of segments involved, para-plegia, duration of preoperative hospitalization, duration of urinary catheter, history of smoking, polytrauma. Possible other factors not available for statistics were given 1 point each and cumulating was computed as a risk factor (diabetes mellitus, massive transfusion, long st ay in ICD, pre and post longlasting wound drainage etc.). Chi-square, Students-t, Mann-Whitney-u, anova tests and logistic regression model were used for statistics.

Results and Conclusion: Logistic regression analysis revealed that the most important risk factors were staged surgery (p = 0,005), pre-operative hospitalization more than 4 days (p = 0,042), polytrauma (p = 0,012), paraplegia (p = 0,039), having more than 1 point of other possible factors cumulating (p = 0,005). Duration of urinary catheters (p = 0,007), duration of operation (more than 210 minutes, p = 0,022) and segments involved (segments between 4-7, p = 0,006) were other risk factors in decreasing importance. Body mass index was a risk factor for adult patients (p = 0.024). Staged spinal surgery increased risk of infection 6 times (risk is 10.5 times higher in early onset group), and hospitalization preoperatively more than 4 days increased risk of infection 6 times (risk is 5.3 times higher in early onset group). For late-onset infection group, only duration of urinary catheters and having more than 2 points of other possible factors was found to be important risk factors (p = 0,009 and p = 0,040 respectively).

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THE EFFICACY OF CONVEX HEMIEPIPHYSIODESIS IN PATIENTS WITH IATROGENIC POSTERIOR ELEMENT DEFICIENCY DUE TO DIASTEMATOMYELIA EXCISION

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Purpose: Anterior and posterior convex hemiepiphysiodesis is a well accepted treatment method for severe and progressive congenital scoliosis in young children. Many patients with congenital spinal deformities have intraspinal pathologies that require neurosurgical intervention with laminectomy. The efficacy of this method has not been studied in these patient populations. The purpose of this study is to investigate the safety and efficacy of anterior and posterior hemiepiphysiodesis in patients with iatrogenic posterior element deficiency.

Materials and Methods: Between 1990-2001, 82 patients with congenital spinal deformity were treated with convex epiphysiodesis. Sixteen patients (2 male, 14 female) who underwent diastematomyelia excision and were followed up far at least 2 years were included. Diastematomyelia excision was performed before the orthopaedic procedure in 8 patients and at the same stage in 8 patients. Mean age at the time of the fusion was 18 months (6-48) and, average follow-up was 41 months (24-120).

Results: The mean Cobb angle was 58° (31-115) preoperatively and, 54° (30-90) at final follow-up. Any increase more than 6 degrees was accepted as progression. Seven patients (44%) had a true epiphysiodesis effect [64° (40-115) preoperatively, and 49° (30-90) at follow-up]; 7 (44%) patients had a fusion effect [50° (31-68) pre-operatively and 53° (36-73) at follow-up]. Two patients (12%) had a postoperative progression of deformity [63° (54-72) preop. and 75° (65-84) follow-up].

Conclusion: Convex epiphysiodesis is an effective method in patients with midline laminectomy defect as in the patients with intact posterior elements. Since the facet joints and transverse processes are usually unaffected, the presence of midline defect does not diminish the efficacy of the technique.