ORAL PRESENTATIONS

THORACIC ADOLESCENT IDIOPATHIC SCOLIOSIS: CORRECTION WITH TRANSLATION USING POLYAXIAL REDUCTION SCREWS

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Introduction: Since the introduction of Cotrel Dubousset instrumentation for three dimensional correction of scoliosis using rod rotation maneuver, newer techniques have been developed providing reduction through translation. In these techniques, translation is mainly achieved by using sublaminar wiring and pedicle hooks. Widespread use of thoracic transpedicular screws, the possibility to use polyaxial reduction screws for translation has appeared.

Material Method: 65 adolescent idiopathic scoliosis (AIS) patients with thoracic deformities have been treated with posterior instrumentation and fusion between 1996-2001. Transpedicular screws were used in all of these instrumentations (Synergy Spinal System, Moss Miami). Reduction screws placed on the concave side of the deformity were tightened and the vertebral column was gradually approximated to the rod, providing correction. Thoracoplasty was performed in 52 of the patients within the same session.

Results: Mean follow-up was 28 months (range 14-70 months). Mean preoperative Cobb angle was 56° (range 40°-92°), while postoperatively it decreased to 12° (range 0°-28°). Mean ratio of correction was found to be 78% (range % 56-100). No neurological complication was encountered. Frontal imbalance was noted in four patients in the early postoperative period, which were controlled with braces.

Conclusion: Significant correction may be achieved in thoracic AIS through posterior instrumentation with polyaxial reduction screws. Additional thoracoplasty provides a better cosmetic outcome.

ORAL PRESENTATIONS

DOES FULCRUM BENDING PREDICT POSTOPERATIVE CORRECTION IN ADOLESCENT IDIOPATHIC SCOLIOSIS KING-MOE TYPE III CURVES?

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Study Design: A retrospective evaluation of radiographs in patients who underwent posterior spinal fusion for adolescent idiopathic scoliosis with King-Moe type III curves

Objective: To determine the most effective preoperative radiographic method for evaluating frontal plane correction by comparing preoperative side bending, traction and fulcrum bending radiographs and postoperative correction.

Methods: Preoperative frontal radiographs of 14 consecutive patients undergoing spinal fusion for King-Moe type III adolescent idiopathic scoliosis obtained while standing, lying supine, side-bending (maximally bending while supine), and fulcrum-bending (curve apex suspended over a radiolucent fulcrum while lateral) were compared with standing postoperative radiographs. Cobb angles were determined and evaluated for statistical significance.

Results: Mean preoperative thoracic Cobb angle was 50.9 degrees (SD 11.7; min 32 max 72 degrees) whereas lumbar Cobb angles measured 24.5 degrees (SD 6.1; range 10-30 degrees). Preoperative side bending, traction and fulcrum bending radiographs revealed 33.1 degrees (SD 14), 37.5 degrees (SD: 13.5) and 25.4 (SD: 11.6) respectively. Postoperative Cobb angles measured 14.4 degrees (SD: 6.7). The difference between preoperative and postoperative values was statistically significant ($p<0.005$). The fulcrum-bending radiograph demonstrated better correction than other preoperative methods for main thoracic curves but under estimated the correction obtained surgically. Side bending radiographs predicted better correction for lumbar curves.

Conclusion: To achieve maximal preoperative correction, thoracic fulcrum-bending radiographs should be obtained for evaluating main thoracic curves, whereas side-bending radiographs are advisable for evaluating lumbar curves.

ORAL PRESENTATIONS

COMBINED ANTERIOR-POSTERIOR ARTHRODESIS FOR ADULT LUMBAR AND THORACO-LUMBAR SCOLIOSIS

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Introduction: Adult lumbar and thoracolumbar scoliosis curves have a higher risk of degeneration and are more likely to be associated with pain. Surgical treatment of these deformities often requires a combined anterior-posterior fusion from thoracic spine to L4, L5 or the sacrum in order to correct rigid deformity, maintain lumbar lordosis and increase fusion rate. Outcome and complication rate differences for fusion to L4-L5 or the sacrum of these adult deformities is not well documented.

Purpose of this study is to investigate the outcome and complication rate of combined anterior-posterior arthrodesis to L4 vs L5 vs Sacrum in patients with painful adult lumbar and thoracolumbar scoliosis.

Material and Methods: Forty consecutive adult patients with lumbar or thoracolumbar scoliosis who had undergone a combined anterior and posterior fusion from the upper thoracic spine to L4 (12), L5 (6) or to the Sacrum (22), with an average age of 53 years (25-78), and a minimum follow- up of two years were included in this study. Peri-operative and long term complications were analyzed and outcome data was obtained by using the modified SRS outcome instrument.

Results: Sixteen patients (40%) had peri-operative minor/major complication. There were thirteen long-term complications. Over all there were more complications in patients fused to the sacrum (13 patients-32.5%) than in fusions to L4 or L5 (6 patients-15%). Patients with short fusions were assessed for degenerative changes distal to the fusion. Three patients had fusions to L4 and three had fusions to L5 had radiographic degenerative changes. Only two patients fusion to L5 had clinical symptoms related to these degenerative changes. The average structural curve correction was 55% for the entire group, with no statistical difference among the groups. Modified SRS outcome instrument score for fusion to the sacrum (73%) was less than for fusion to L5, L4 (83%). Patients with fusions to sacrum scored lower in all categories than fusions to L5 or L4.

Conclusion: Patients with fusion to the sacrum had a higher complication and a lower outcome score. Despite a high complication rate, 86% of our patients were satisfied with their overall outcome and 89 % of patients would have the same management again. Combined anterior and posterior arthrodesis for painful adult lumbar and thoracolumbar spinal scoliosis provides a predictable correction of the deformity, excellent pain relief, and an extremely high patient satisfaction rate in patients for whom this extensive surgery is indicated.

ORAL PRESENTATIONS

TREATMENT OF THOROCOLUMBAR SCOLIOSIS WITH ANTERIOR INSTRUMENTATION; ADULTS VS. ADOLESCENT

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Introduction: Recent reports have shown excellent deformity correction and high patient satisfaction with anterior spinal fusion in well selected patients However comparisons between these two groups, have not been reported. Objectives of this study are to evaluate the efficacy of anterior instrumentation and compare radiographic and clinical outcomes of anterior spinal fusion in these two patients populations.

Methods: A retrospective review of 30 consecutive cases with minimum 24 months follow-up in which anterior spinal fusion of thoracolumbar and lumbar idiopathic scoliosis in adults and adolescents was performed. One adult and one adolescent were lost to follow-up. Charts were reviewed, and pre- operative, post-operative, and final follow-up films of the entire spine were evaluated. Modified SRS Outcomes Instrument (MSRSI) used for clinical outcome evaluation.

Results: The average pre-operative major curve was similar in both groups which improved to 13 degrees at follow-up, with a 73% correction. The thoracolumbar sagittal plane alignment (T11-L4) was -15 degrees preoperatively and -13 degrees postoperatively. On average 1.1 levels were "saved". Follow-up MSRSI total outcome scores averaged 85%, and scores were high within the follawing domains without difference between adults and adolescents. There were significant differences in post-op curve, curve correction, flexibility and number of "saved disks" (Table 1).

Conclusions: The radiographic and clinical outcomes of anterior spinal instrumentation and fusion in this select group of adults and adolescents are highly satisfactory. Significant differences were found in numbers of discs saved, flexibility of pre-operative curves, and final post-operative correction of the major curves. Adults presented with pain, while adolescents presented with cosmetic complaints and curve progression. Although the absolute primary curve magnitudes were similar, the more rigid curves adults require longer fusion constructs to allow adequate balancing of the spine in the coronal and sagittal planes.

Table 1: Results

	Age	Follow-up (min. 24 months)	Preop-Major curve	Curve Flexibility	Post-op Major curve	Major Curve correction	Saved disks	MSRSI
Adult	37	47	51°	63%	17°	68%	0.6	82%
Adolescent	16	46	49°	79%	10°	80%	1.5	88%
Total	27	47	50°	70%	14°	73%	1.1	85%
p	<0.05	>0.05	>0.05	<0.05	<0.05	<0.05	<0.05	>0.05

ORAL PRESENTATIONS

TRUNK BALANCE ANALYSIS OF LATE ONSET IDIOPATHIC SCOLIOSIS PATIENTS TREATED WITH TSRH INSTRUMENTATION

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As scoliotic curve is a rotational deformity, derotation maneuvre was used as the corrective factor, but recent studies demonstrated spinal imbalance and decompensation problems in patients treated with this method. This study evaluates 217 late onset idiopathic scoliosis patients surgically treated Texas Scotish Rite Hospital System (TSRH) from September 1991 to November 1996 with a minimum 5 years follow up. Preoperative and postoperative Cobb angles in the frontal plane and thoracic kyphosis and lumbar lordosis angles in the sagittal plane are measured. The balance was analyzed clinically and radiologically by measurement of the lateral trunk shift (LT), shift of head (SH) and shift of stable vertebra (SS) in vertebral unit (VU). At final follow -up correction loss, infection and other complications were documented. Mean age of the patients was 14.8 ± 2.3 and mean follow up period 91.8 ± 29.5 months. When all the patients were included, preoperative mean Cobb angles of major curves in the frontal plane was 59.1° ± 20.1° Major curves that were corrected by 34.8 ± 20.5 % in the bending radiograms were achieved by 58.9 ± 19.5 % correction postoperatively. At the last control, 8.6° ± 7.4° of correction loss was recorded in major curves in the frontal plane. Also postoperative kyphosis angle and lumbar lordosis angles were 31.4° ± 11.6° and 30.6° ± 10.9° respectively. Postoperatively, a statistically significant correction was obtained in LT, SH and SS values. None of the patients had complete balance (SH: 0 VU, SS: 0 VU) preoperatively. Only 39.2 % of the patients had clinically balanced curves (0 VU < SH < 0.5 VU and 0 VU < SS < 0.5 VU). Postoperatively, 47.9 % of the patients were found to be completely balanced, while 43.8 % had a balanced curve. Overall 91.7 % of the patients had a trunk balance after surgical intervention. The remaining 8.3 % imbalanced curve rate raised up to 16.6 % at final follow up, but the loss of correction rates in SS and SH values were found to be insignificant. The postoperative "imbalance" problem was mostly seen in Type II and Type IV curves. However, at final follow up, the imbalance problem due to overcorrection which became evident especially by "shift of head" to opposite side was seen in all types of curves. It is established that high correction rates can be obtained in scoliotic curves with TSRH instrumentation. No undue effects were observed in the uninstrumented lumbar curves. Thoracic sagittal contours of the hypokyphotic patients were improved. Use of this instrumentation system causes minimal imbalance problems and with proper preoperative planning high correction rates can be achieved.

ORAL PRESENTATIONS

NEURAL AXIS ABNORMALITIES DETERMINED BY MRI IN THE PATIENTS WITH TYPE III IDIOPATHIC SCOLIOSIS

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Purpose: Evaluate the existence of neural axis abnormalities by magnetic resonance imaging (MRI) in patients who have clinically and radiological absolute flexible thoracic curves (King -Moe Type III).

Study Plan: There are additional congenital deformities in some patients who are considered to have idiopathic scoliosis. On the other hand MR scanograms revealed neural axis abnormalities especially in patients with infantile and juvenile rigid idiopathic scoliosis. In this study preoperative, MRI graphs of 84 patients (average age 14.1 ± 3.6) with adolescent idiopathic scoliosis who had flexible thoracic curves were evaluated prospectively. Clinical and radiological indications for MRI are investigated according to these results.

Results and Conclusions: Five patients (5.9 %) were found to have syringomyelia while diastometamylia was found in 1 (1.2 %) patient. The finding of 7.1 % neural axis abnormality in patients with type III curves - the curve type which is not expected to be in association with these kind of abnormalities - is a considerably high rate and this result supports the idea that intraoperative neurologic monitorization is absolutely essential to minimalize the risk of neurological deficits. This study did not reveal any clinical or radiological indicator for preoperative MRI. As results, preoperative MRI is essential to minimalize the neurological deficit risks, to determine the type of treatment and prognosis even in Type III curves unless intraoperative neurologic monitorization is available.

ORAL PRESENTATIONS

ANTERIOR FUSION AND INSTRUMENTATION IN THE TREATMENT OF CONGENITAL SPINAL DEFORMITIES

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Study design: An analysis of the effect and results of anterior fusion and instrumentation in fourteen patients treated for congenital spinal deformity.

Summary of Background Data: Posterior arthrodesis have been used in wide series with success to treat the congenital deformities. But necessity for fusion of long segments, crankshaft phenomenon especially in Risser 0 patients with open triradiate cartilages, risk of pseudoarthrosis, being unable to perform hemivertebra excision are disadvantages. Anterior fusion and instrumentation mostly used in idiopathic cases is reported to have the advantage of providing triplanar correction while sparing distal segments.

To our knowledge, there is no reported series about anterior fusion and correction with anterior instrumentation of congenital spinal deformities in the literature.

Objectives: The degree of correction obtained and maintained, changes in sagittal profile, pelvic obliquity, spinal alignment, balance, and complications were evaluated.

Methods: Diagnosis was scoliosis in six cases, kyphoscoliosis in eight cases. Mean age at operation time was 11.2 years (range, 4 to 18 years). Postoperative follow up averaged 18 months (range, 12 to 49 months)

Results: Regarding coronal plane deformity, average index curve was 54 degrees preoperatively; 32 degrees at the time of discharge from the hospital and 34 degrees at the latest follow up. Early average correction obtained was 22 degrees (41 %). Eight curves in coronal plane were better compared with the preoperative radiograph of the best side bend, by an average of 10 degrees. In eight cases of kyphoscoliosis sagittal plane deformity improved from 65 degrees to 40 degrees at the time of discharge from the hospital and 43 degrees at the latest follow up with an early average correction of 25 degrees (% 38). The sagittal profile changes in cases with isolated coronal plane deformity were evaluated; no progressiye kyphosis greater than 10 degrees was observed. Increase in kyphosis averaged 7 degrees. Lumbar lordosis did not change significantly. Pelvic obliquity existing preoperatively in 10 cases improved from 9,2 (3-20) degrees to 5,1(0-13) degrees postoperatively. Preoperative decompensation of 2,4 (0,5-9) cm improved to 1,3 (0-4,5) cm postoperatively. Preoperative trunk shift of 5,5 (3,1-11) cm was corrected to 4,2 (0-10) cm postoperatively. Junctional kyphosis above the level of most proximal level of instrumentation (T11) occurred in one case of kyphoscoliosis and pseudoarthrosis was observed in a case of scoliosis. No neurological complication occurred.

Conclusion: Anterior instrumented fusion is an effective and safe method for obtaining and maintaining correction of congenital spinal deformities.

ORAL PRESENTATIONS

PAIN IN PATIENTS WITH SCOLIOSIS AND SYRINGOMYELIA

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Background/Purpose: In patients with scoliosis [SC] pain is an indication for further investigation for intraspinal abnormalities such as syringomyelia [SM], Arnold-Chiari Malformation [ACM], and tethered cord. However, there has not been much known about the pain pattern and relationship between pain and syrinx in these patients. The main purpose of this study was to investigate the pain found in patients with SC and SM.

Methods: The records of 119 patients with SC associated with SM were analyzed. Patients with congenital SC and myelomeningocele [MM] were included, whereas patients with SM associated with tumors, trauma, and arachnoiditis were excluded. The mean follow-up was 11.8 years.

Results: Seventy patients (59%) had associated spine pain, at the average age of 18.1 years (range, 3.1-47.6 years). Pain was present at the time of the initial diagnosis of the SC in 23 patients (19.3%). In the remaining 47 patients, the onset of pain occurred from 1.5 months to 44.5 years after initial SC diagnosis. Thoracolumbar pain was the most frequent (47.1 %) location of pain; headaches (32.9%) and cervical pain (28.6%) were also encountered. Among the 70 patients with pain, 32 patients (46%) continued to have pain at late follow-up.

The incidence of headaches was higher in patients with MM (p=0.032). The presence of headache alsa increased with the presence and severity of an ACM (p=0.027). There was no significant correlation between the size of syrinx as measured by the maximal diameter and the length of the syrinx and the presence of pain (p>0.05). The only relationship between location of syrinx and type of pain was the significant correlation between presence of lower extremity radicular pain and more caudally located syrinx (p<0.05).

Conclusions: (1) Pain is a fairly frequent (59%) accompaniment in these patients. (2) Pain may develop after the initial diagnosis of scoliosis, and inquiry for presence of pain should be conducted throughout follow-up visits. (3) Pain persisted at late follow-up in approximately one-half of the patients. (4) The presence of leg pain in a patient with scoliosis should raise the suspicion of a caudally located syrinx. (5) There appears to be no correlation between size of syrinx and presence of pain.

ORAL PRESENTATIONS

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 for 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) preoperatively 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 is 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.

ORAL PRESENTATIONS

ANALYSIS OF UPPER AND LOWER THORACIC KYPHOSIS IN HEALTHY INDIVIDUALS

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Objective: To determine if there is any interaction between upper and lower thoracic kyphotic segments, as well as to analyze their variation with age and sex.

Methods: This prospective study includes 157 healthy individuals without any complaints related to their spine, and a thoracic kyphosis of not more than 50 degrees. Subjects were evaluated by medical history, physical examination, and standing spinal roentgenograms. Cases with prior history of spinal trauma, surgery, or other abnormalities and pathologic conditions were excluded. Age and sex of the patient, together with the degree of upper (T1-5), lower (T5-12) and the whole (T1-12) thoracic kyphosis -measured by the Cobb method- were the parameters used for statistical analysis.

Results: There were 49 male and 108 female with the mean age of 42.1±16 years (range, 11-76). Mean values of the upper, lower, and whole thoracic kyphosis were found to be 13±6° (range, 2-30°), 21±8° (range, 4-43°), and 34±9° (range, 11-50°), respectively. No significant differences for any parameter could be detected between men and women. Increasing age correlated to a higher degree of kyphosis in the lower thoracic segment, without an increase in the upper thoracic kyphosis (Pearson correlation test, c=0.222, p=0.007, c=0.038, p>0.05, respectively). There was also a negative correlation between the degree of the upper and lower thoracic kyphosis (Pearson correlation test, c=-0.194, p=0.015), suggesting that one segment has the capability to decrease for some amount, when the other segment is increasing in healthy individuals.

Discussion: Degree of upper thoracic kyphosis reported by Geib et al. [Spine 20(12):1351-3], was almost the same as ours [14±8° (range, -4-35°)]. Taken into consideration that the average age of their patients were higher than ours (57 years), the finding that the degree of lower thoracic kyphosis was higher than ours was also in consistency with our finding that the lower thoracic kyphosis increases with age. In addition, by using the data of this previously published series, the interaction (negative correlation) between the upper and lower thoracic kyphosis could also be demonstrated (Pearson correlation test, c=-0.245, p=0.046).

The interaction between the upper and lower thoracic kyphosis could also be demonstrated by using the data of a previously published study of Gelb et al.

[Spine 20(12):1351-3, 1995], (Pearson correlation test, c=-0.245, p=0.046).

Conclusions: Kyphosis of upper thoracic segment did not change with age, whereas, there was a significant increase of kyphosis in the lower thoracic segment. In addition, there seems to be an interaction (negative correlation) between the upper and lower thoracic kyphosis, suggesting that there is some amount of "compensation" between each other in healthy individuals.

ORAL PRESENTATIONS

COMBINED ANTERIOR-POSTERIOR SURGICAL TREATMENT FOR ADULT THORACOLUMBAR POTT'S DISEASE

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Introduction: Tuberculosis, which is closely related to socioeconomic structure, continues to be a major cause of morbidity and mortality worldwide. In endemic regions, bone penetration has an incidence of 10% for tuberculosis and 50% of these cases are Pott's disease. Two basic problems of the disease are development of vertebral deformity and neurological deficit.

Materials and methods: 16 adult patients with Pott's disease underwent anterior debridement, and strut grafting, followed by posterior instrumentation and fusion between 1995 and 2001. 14 cases with sufficient follow-up time have been evaluated. 6 women and 8 men patients had a mean age of 36 (21-70). Locations were thoracic in 4, thoracolumbar in 7, lumbar in 2 and lumbosacral vertebrae in 1 case. Tricortical iliac and costal grafts were used in 7 cases whereas fibular and costal grafts in 3, only costal in 2, femoral allograft in 1, and titanium cage in 1 case for anterior stabilization. Posterior procedure included pedicular screw-hook combination for instrumentation, and fusion. Postoperative chemotherapy was applied for 9 months. All cases were defined via culture and/or histopathological examination. Mean follow-up period is 36,3 months (12-78).

Results: 4 cases with Frankel A and C preoperatively upgraded to D whereas 5 cases with Frankel D upgraded to E. 5 cases with Frankel E conserved their levels. Mean preoperative kyphotic angle of 27° (4°-56°) has been measured as 12° (4°-22°) in early postoperative period. In late follow-ups, mean kyphotic angle was measured as 16,8° (5°-40°) with a mean correction loss of 6,8°. Mild low back pain was the only complaint in 5 cases. No problem was observed concerning anterior strut grafting. Posterior deep wound infection in one case was eradicated after extraction of instruments when solid fusion was obtained in 8th month. Infection did not relapse in any of the cases.

Conclusion: Basic aims in treatment of vertebral tuberculosis are eradication of active infection, prevention of deformity and paraplegia. Infection can be controlled by chemotherapy. But chronic sagittal imbalance can best be corrected via anterior approach and strut grafting. Posterior instrumentation prevents graft fracture, resorption and insuffıciency. It. decreases rate of pseudoarthrosis and permits early ambulation.

ORAL PRESENTATIONS

RISK FACTORS OF POSTOPERATIVE DEEP WOUND INFECTIONS IN SPINAL INSTRUMENTATION, ANALYSIS OF 869 CASES

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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, paraplegia, 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, massiye transfusion, long stay in ICU, pre and post long-lasting wound drainage ete.). 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), preoperative 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-on set 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).

ORAL PRESENTATIONS

SURGICAL OUTCOME OF PRIMARY BENIGN AND MALIGNANT SPINAL TUMORS

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The objective of surgical treatment in painful and disabling spinal tumors is the pathological identification of the tumor, neurological decompression, establishment of spinal stability and maintenance of a comfortable life span. Twelve benign (BPST) and 17 malignant primary spinal tumors (MPST) cases were assessed according to their clinical, radiological and surgical outcome in this study. The average age of BPST and MPST cases were 48.1 (7-66) years and 51.6 (13-65) years respectively. Computerized tomography (CT) and magnetic resonance (MR) was obtained for radiological assessment. Together with Enneking classification, Weinstein Boriani (WBB) surgical staging was used for surgical planning. Benign tumors were most commonly located in L-1 vertebra. The average of affected vertebra was 1.1±0.4 and the most common BPST types were eosinophilic granuloma (3 patients), aneurysmal bone cyst (3 patients) and hemangioma (3 patients). Following en-block resection, neurological findings of patients with BPST recovered 100 %. Anterior approach, autologous strut grafting and anterior instrumentation was carried out in 9 patients, while posterior approach, autologous fusion and instrumentation was preferred in 3 patients. The involvement of mobile segments in the fusion area was 3 in the cervical, 2.6 in the thoracal and 2 in the lumbar region. Sagittal contours improved significantly by this method. Total pain relief was observed in 7 patients while pain decreased significantly in the remaining 5 BPST patients. In 17 MPST patients, the average of involved vertebra was 1.8±1.1, all patients were Enneking stage II B and the involvement according to WBB was between 4 and 9. All patients underwent anterior vertebrectomy. 13 had anterior or fusion and autologous strut grafting, while posterior autologous fusion and instrumentation at the same session was the method of treatment in the remaining 4 patients. An average of 3.2±1.7 mobile segments was obtained by this method. Eight of the MPST patients had preoperative neural deficits. The rate of total recovery following surgery was 75 % and improved in neurological status was observed in 25 % patients. The most common type of lesion was multiple myeloma followed by plasmocytoma and osteosarcoma. The preoperative pain - functional assessment (PFA) score decreased from 16.9 to 10.0 ($p < 0,05$). In conclusion, en-block tumor excision, anterior strut grafting and/or anterior or posterior instrumentation in the same session is effective in the maintenance of spinal stability, relief of pain, recovery of neural symptoms and improved functional capacity.

ORAL PRESENTATIONS

Treatment of Vertebral Body Replacement wİth Expandable Titanium Cages

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Introduction: Instabilities of different origin with insuffieient anterior column support due to destruction of the vertebral bodies should be stabilized and the anterior column should be restored. This can be done with the anterior distraction device (ADD, Ulrich Medizintechnik, Ulm, Germany) in the cervical spine combined with an anterior plate and in the thoracic and lumbar spine with the vertebral body replacement (VBR, Ulrich Medizintechnik, Ulm, Germany) combined with an posterior instrumentation. Both implants, the ADD and the VBR are continuously insitu distractible devices.

Methods: Between April 1997 and March 2002, 39 patients were treated with vertebral body replacement in the orthopedic department of the University of Ulm. Average age of patients was 59,4 years (range: 38,3 - 77,9 years), 14 of them have male and 25 female gender. The diagnosis was in 21 cases vertebral body destruction by tumour or metastasis, in 14 cases unstable osteoporotic and in 4 cases traumatic fracture of the vertebral bodies. In the tumour patients there were in 6 cases metastasis of breast cancer, in 5 metastasis of an kidney tumour, in 4 cases plasmocytoma and 1 patient with the metastasis of a prostata-, bronchial-, oropharynx-, uterus-, nasal mucous membrane careinoma and osteosarcoma of the vertebral body, respectively. The average follow-up was 14,5 months (range 3,1 - 56,4 months).

Results: Tumour embolisation was performed in 5 patients with a metastatic destruction by kidney tumour. In 4 cases the vertebral body replacement was done in the cervical spine in a single anterior approach with the ADD, combined with an anterior plate fixing of the adjacent vertebral bodies. In 9 cases we performed an anterior vertebral body replacement in the thoracic, in 14 cases in the thoracolumbal, in 10 cases in the lumbar and in 2 cases in the lumbosacral spine. All these operations were made as a double approach after posterior instrumentation of the adjacent vertebral bodies wilh an internal fixator. The average intraoperative bloodloss for was 1800 ml (range: 250 ml - 6500 mi) and the average operation time was 180 min (range: 95 min - 420 min).

Following intraoperative complications were reported: 1 female patient with metastasis of a breast cancer died in haemorragic shock (perioperative bleeding loss: 15700 ml). 2 patients had duralesions. Postoperalive two patients developed an infection of the urinary tract, 1 patient a deep venous thrombosis. 2 palienls who have had radicular symptoms preoperatively kept them postoperatively. At the further follow-up there was no implant related complication. No implant dislocation or breakdown was registered. 1 patient had an implant loosening due to tumor growth which was reoperaled. 16 of 18 patients with fractures had stili a good pain relief, good reconstruction of the anterior column and a restoration of the sagittal profile. 10 of the tumour patients (47,6 %) died for tumour progression in the further follow up. On average they reached a survival of 190 days (range: 54 days - 328 days).

Conclusions: The ADD for the cervical and the VBR for the thoracic and lumbar spine are in situ continuously distractible vertebral body replacement systems. Indications are the stabilization and restoration of the anterior vertebral column after total or incomplele vertebrectomy due to destruction of the vertebral bodies. Causes of vertebral body destruction could be tumors, fractures or inflammations. Advantages of bolh systems is the simple and safe implantation and the short operation time with less blood loss. In our opinion both systems promise a good clinical and radiological result.

ORAL PRESENTATIONS

SURGICAL APPROACH IN T4N0M0 (VERTEBRAL INVOLVEMENT) LUNG CANCER

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Objective: Approximately five percent of the lung cancers involve the chest wall and spine by direct extension and remain localized at the time of diagnosis. T4 lesions invading the vertebra are considered inoperable. Although there have been isolated reports of cures of these tumors by surgical resection combined with external radiation or by the use of intersititial implants, 5-year survival rates from different reports are approximately %20.

Methods: During 1998-2002, four patients with T4N0M0 (vertebral involvement) lung cancer underwent en-block surgical resection. All patients were males with a mean age of 57 years (range 46-66). Histological diagnosis was adenocancer in three and squamous cell cancer in one patient. Neoadjuvant chemotherapy in two patients whereas combined radiotherapy and chemotherapy in the other two patients were applied prior to surgery. Involved vertebral levels were Th1-2, Th3-4, Th3-6 and Th4-5 in each patient respectively.

Posterior stabilization, hemilaminectomy and osteotomy of the involved vertebral bodies below the corresponding pedicle was performed in the prone position and then in lateral position en-block resection were completed along with the lung resection and involved vertebral bodies.

Results: Three of the patients were died during the follow-up period at 6., 8. and 14. months respectively. The last patient is still in follow-up.

Discussion and Conclusion: Although T4NOMO (vertebral involvement) lung cancers are considered inoperable, lung resection with hemivertebrectomy of the involved vertebra after neoadjuvant chemotherapy and radiotherapy is an alternative treatment in this type of lung cancers.

ORAL PRESENTATIONS

SURGICAL OUTCOME OF METASTATIC SPINAL TUMORS

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Spine is a part of the skeleton involved most frequently by metastatic tumors due to its rich blood supply. The surgical treatment of metastatic tumors is usually carried out by the extensive of tumor tissue which is though to influence prognosis favourably. In this study, 30 patients with metastatic vertebrae involvement were investigate for clinical,radiological and pathological findings apart from outcome of tumoral excision, spinal fusion and instrumentation. The average age of the patients with metastatic tumors was 49.2 (21-70). Metastatic tumors were classified according to Harrington classification and Tokuhashi prognostic scoring system was used. It was established that the majority of patients were between the ages 40-69 and the most frequently involved part of spine was lumbar region. Tokuhashi score was mean 9.2 and as it was determined that involvement was in anterior corpus in all patients, following the extensive excision of tumor from anterior and autologous strut grafting, in cervical, thoracal, thoracolumbar and lumbar regions, 2.4, 2.8, 3, and 2.3 mobile segments were instrumented from anterior or at the same session from posterior with titanium plate or rod systems. Overall, it was determined that sagittal index which was 19.2 degrees preoperatively was corrected by 80.8 % postoperatively. The most commonly encountered histopathological type was lung cancer 19 (63.3 %) patients, followed in order of frequency by breast, gastrointestinal system, thyroid and prostate cancers. It was found that, of 15 (78.9%) patients with lung cancer and neural deficit, improvement was seen in 13 patients. Pain and Functional Assessment (PFA) score which was found to be 15.8 preoperatively was determined to fall as low as 7.5 postoperatively. In view of these findings, it was concluded that spinal instrumentation, performed in metastatic tumors following extensive anterior radical excision and anterior autologous strut grafting in order to provide spinal stability and maintain sagittal contours, is beneficial in terms of decrease in pain and increase in functional capacity.

ORAL PRESENTATIONS

FAILURES IN ONCOLOGIC SURGERY OF THE SPINE: CASES AND TREATMENT

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Objectives: Failures in the treatment of bone tumors of the spine are related to common surgical complications, but the most relevant complication is the recurrence of the tumor. The purpose of this study is to stress on the risks of revision surgery.

Methods: From January 1997 to June 2000, 192 procedures were performed in the spine for tumors. Fifty-nine revisions were performed in tumors in 51 patients. Tumor recurrence was the main indication to revision surgery (48/59, 81 %); mechanical failure of the hardware required surgery in 4 cases, wound dehiscence in 2 cases, haematoma in 1, aortic dissection in 1.

All the cases were submitted to clinical and radiographic serial controls to monitor the incidence of further recurrence and/or other complications.

Results: Revision surgery is burdened by high risk of further failure: on 48 procedures performed for a tumor recurrence, a further recurrence occurred in 17 cases, (35%). The rate of recurrence observed in the same period in tumors not previously treated in 6% (9/133). This is a very important figure as it remarks the relevance of an appropriate treatment of tumors, according to oncologic criteria, considering that the accuracy of the first treatment is the most important prognostic factor. Complications occurring due to dissection on surgical scar are important as well, as vessels, ureter, nerve roots and dural sac are at major risk during revision surgery (in our series 2 lesions of the aorta, 1 haematoma, 2 wound dehiscence occurred).

Conclusions: Tumor surgery must be performed according to the strict oncologic criteria 1, which dictate the need of enbloc resection for lowgrade malignant tumors and for aggressive bening tumors. High grade malignant tumors must be submitted to the specific protocols of chemo and radiation therapy combined with enbloc or intralesional surgery. Active benign tumors can be treated with intralesional extracapsular excision, combined with radiation in selected cases. An appropriate local control can be achieved in most metastatic disease with intralesional excision combined with radiation and or chemotherapy (immunotherapy and hormonal in selected cases). Renal cell carcinoma is an important exception, requiring when feasible, en bloc resection for reducing the high risk of local recurrence. Revision surgery is at high risk of further recurrence (due to the tumor contamination in the surgical scar of the previous procedure) and requires extensile dissections of important structures included in the scar during the previous anterior approach (ureter, aorta and vena cava, peritoneum, pleura, diaphragm, hypogastric plexus, thoracic duct, oesophagus. In the posterior surgery, the dural sac can be damaged (particularly if a lesion had been provoked in the first surgery), and the repair can be difficult due to fibrotic lack of elasticity. Before deciding to treat a spine tumor, one should consider that the risk of local recurrence is 5 times higher after the first recurrence. The first treatment is critical on the final result and must be planned by a pluri specialistic team with specific oncologic formation.

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THE EFFECT OF CONTINUOUS EARLY CHILDHOOD BAEK STRETCHING IN PREVENTING ADULTHOOD LOW BAEK PAIN. A NEW THEORY

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Introduction: Low back pain, a common problem in adults, usually results from the inability of the spine's posterior longitudinal ligament and annulus fibrosis to stretch, especially while bending with the knees in a straight position. Thus, it can rupture due to a wrong movement allowing the disc to prolapse. Rupture does not occur in children because their ligament is elastic and stretches on bending.

Objective: If elasticity of this ligament and annulus fibrosis is preserved from childhood, would this reduce the incidence of low back pain and disc prolapse in adulthood? Of the forms of worship in Islam, only praying is compulsory, and is mandatory from age seven. The ritual of Islamic praying causes stretching of the posterior longitudinal ligament and annulus fibrosis at least seventeen times during five-daily prayers. Thus, from an earlyage, Muslim children habitually stretch their back ligament, which preserves the elasticity.

Method: One hundred eighty eight adults were questioned if they have low back pain, defined as mild if it did not bother them, and severe if the pain was agonizing. These persons were divided into three groups: 78 Moslems who started praying before the age of ten, 50 Moslems who started after age thirteen, and 60 non-Moslems.

Results: In those who began praying before the age of ten, 82% had no pain, 15.4% had mild pain, 2.6% severe pain and 0% had sciatica. In those who began praying after the age of thirteen, 36% had no pain, 16% mild pain, 26% severe pain, and 22% had sciatica. Of the 60 non-Moslems, 20% had no pain, 10% mild pain, 45% severe pain, and 25% had sciatica.

Conclusion: Continuous lower back stretching beginning in childhood preserves ligament and annulus fibrosis elasticity which dramatically reduces the chances of low back pain and disc prolapse in adulthood.

ORAL PRESENTATIONS

THE ENDOSCOPIC MICRODISCECTOMY

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Study Design: The author's experience with a new minimally invasive video-assisted technique in the management of lumbar disc herniation.

Objectives: To describe the history of surgical techniques about the treatment of lumbar disc herniation and to discuss the indications, the surgery, the procedure, the validity, the advantages and disadvantages and the outcome of micro-endoscopic technique as an effective option to the standard laminectomy-discectomy and the microsurgical techniques.

Summary of Background Data: In contrast to standard laminectomy-discectomy and the microsurgical techniques, the mini-invasive videoassisted procedure reduces surgical exposure of the spinal passage and the insult to myoligamentous stabilizing structures and intracanalicular tissues. The enlargement associated with a good illumination reduces the bleeding and it allows a very good sight of the details.

Methods: Since October 1999, 48 patients underwent the micro-endoscopic procedure, mean age 44.5 years. The operated disc levels were mostly L4-L5/L5-S1 (20 patients respectively). Most of the disc herniations were intra-canalar. All patient had: 1) not responded favorably to nonoperative treatment, 2) a persistent radiculoaty with strength and sensitivity deficit.

Results: All patients had experienced substan relief of their radiculopaty, and were dischart home within 12-24 h of surgery. The actual results show 95% had excellent or good outcomes. There were no complications, except for two intraoperative cerebro-spinal fluid leaks without consequence. Clinical observation of the other 48 patients m recently submitted to micro-endoscopic technic confirm these results and confirm that in a group selected patients, a successful outcome similar better to macro or microdiscectomy may achieved.

Conclusions: The minimal invasive video-assisted technique has a learning curve. In contrast with the percutaneous discectomy, this technique is target - oriented and capable of retrieving sequester migrated herniations and also to perform recalibrage of 1 or 2 spaces. Disadvantage bidimensional vision, as for any endoscopic surgery, and a possible longer duration of surgery, particulariy at the beginning of the learning curve.

ORAL PRESENTATIONS

COMPERATIVE STUDY OF ENDOSCOPIC AND CONVENTIONAL DISCECTOMY FOR LUMBAR DISC HERNIATION

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Objectives: The purpose of this study was to compare the clinical outcome of endoscopic and conventional discectomy for lumbar disc herniation.

Methods: Between 1998 and 2001, 40 consecutive patients with lumbar disc herniation were treated surgically. All patients had persistent or frequently recurring leg pain resistant to active nonoperative treatments for a minimum of 3 months. The first half of the patients underwent conventional discectomy (Group 1), and the second half microendoscopic discectomy (Group 2). Both groups were comparable with regard to age, disk levels, and types of herniation. These patients were prospectively followed and clinical outcomes were evaluated by a follow-up questionnaire regarding pain, function, and patient satisfaction.

Results: All 40 (100%) patients were subject to follow-up evaluation and completed the postoperative questionnaire. The mean follow-up period was 27 months (range, 12-48 months). Improvement of leg pain in the visual analogue scale (VAS) was noted in both groups. The mean VAS was 8.5 before surgery and 0.9 after surgery in Group 1, and 8.9 and 1.0, respectively, in Group; Improvement of low back pa in was also observed. The mean VAS was 5.4 before surgery and 1.3 afte surgery in Group 1, and 4.6 and 1.1, respectively, in Group 2. In regard to pain of surgical wound, the mean VAS was 5.1 in patients who went througt conventional technique (Group 1) compared with 3.3 in patients who underwent endoscopic surger. (Group 2). Based ori their satisfaction, all 20 patient: subjected to conventional discectomy (Group 1 chose "Surgery met my expectations", whereas five of the 20 patients after endoscopic discectom) (Group 2) selected "I did not improve as much as had hoped but I would undergo the same surgery for the same outcome".

Discussion and Conclusion: There were no significant differences in surgical outcomes between endoscopic and conventional discectomy. Patients that underwent conventional discectomy appeared tc be more satisfied. Because endoscopic discectomy is a new procedure, it is assumed that patients' expectations were higher, thus, resulting in lower satisfaction. Significant improvement of low back pain was noted across the entire sample. These findings suggest that lumbar disc herniation might be a possible cause of low back pain.

ORAL PRESENTATIONS

SURGICAL TREATMENT OF MULTIPLE LEVEL CERVICAL DISC DISEASE

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Cervical disc disease may occur at multiple levels and in this case, multiple level anterior discectomy with fusion and plating and middle corpectomy with fusion and plating are widely used operative treatment options. In this study, operatively treated multiple level cervical disc patients at our clinic are presented and indications of discectomy and corpectomy are discussed.

Between 1998 and 2001, we operated 45 patients with two or more multiple level cervical disc disease. Of patients 29 were female and 16 were male. The mean age was found 48.8 (range 32-72). 87% of the patients admitted with neck and/or arm pain, and various neurological deficists were detected all of the patients. Nine patients showed myelopathy findings in neurological examination. Anteroposterior and lateral x-rays, functional x-rays, and MRI were performed in all patients. Two level disc disease was detected in 35 cases, 3 level in 9 cases and 4 level in one case.

14 of patients were operated using Smith-Rolland technique, corpectomy was done in 29 patient combination of both in 2 patients. Cervical was performed in both discectomy and corpectomy. Mean follow-up time was detected as 21 months (range:4-51 months) No peri-operative complication was observed but one patient due to screw and one due to graft slippage were reopered early post-operative period. Because of recurrent stenosis one patient was reoperated at the 1 first year. Out of these three patients, other patients were relieved and myelopathic signs were regressed in that patients.

In the presence of only discal comprehensive discectomy with fusion and plating is enough without damaging any vertebrae. In the case of any presence of ligamentous compression ante corpectomy is needed with fusion and plating.

ORAL PRESENTATIONS

A NEW SPACER FOR EXPANSIVE OPEN-DOOR LAMINOPLASTY

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Objective: Expansive open-door laminoplasty (ELAP) is one of the prevailing decompression techniques for cervical spinal stenotic myelopathy, whose advantage is not only to be able to preserve the posterior elements but also to reduce the operation time compared with conventional laminectomy. In original technique by Hirabayashi (Spine 1983), no spacer was supposed to be used, but recently various types of hydroxyapatite (HA) spacer have been used to prevent the open lamina from being closed. But it needs time-consuming procedure to suture between the spacer and the lamina to keep it in position. We developed a new spacer that needs not be stabilized by suture. We will introduce the preliminary results of ELAP using this new spacer.

Materials and Methods: Our new model of spacer is made of titanium, whose shape is are, length is about 3 cm, and width is 8 mm. The conventional spacer is put in the space between the edge of the open lamina, but this spacer is set in the gutters on the lamina drilled with q>1.7 mm steel burr. In 57 cases(cervical spondylotic myelopathy(CSM) 39, OPLL 7, trauma 10, tumor 1, follow-up period more than three months) operated on using this spacer, operation time and displacement of the spacer were examined. In 26 cases (CSM 22, OPLL 4, follow-up period 12 months to 36 months), sagittal diameters in lateral X-ray, range of motion, clinical results evaluated by Japanese Orthopaedic Association Score (JOAS) were examined.

Results: The average operation time was 145 minutes, taking 30 minutes per lamina. It took 14 minutes to set the all the spacers (3.5 spacers were set per operation on average). X-ray at the follow-up time showed slight displacement of the spacer in 2 cases, but CT showed they were working to maintain the enlargement of the spinal canal. No major displacement or complications due to the spacer were found. The average sagittal diameter increased from 11.9mm to 16.2mm. The range of motion decreased from 3° to 25°. JOAS changed from 11.6 to 14.7 on average. There was no case in which clinical symptoms worsened except one patient who died of MRSA sepsis.

Discussion and Conclusions: The operation time of our previous method was 213 minutes in which HA spacers on the market that need suture were used. We could save 68 minutes in operation time or 10 minutes per lamina by this spacer. The difference of operation time between "with spacer" and "without spacer" reported by Satomi et aL. is 60 minutes. Our result 14 minutes is one fourth of theirs. The increase of sagittal diameter, the decrease of range of motion, and clinical results were almost the same as other reports.

Our spacer is useful because it can reduce the operation time with the same clinical results as others and without any complications due to the spacer.

ORAL PRESENTATIONS

RESULTS OF SURGICAL TREATMENT' FOR DEGENERATIVE LUMBAR SPINAL STENOSIS

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Introduction: Degenerative lumbar spinal stenosis (DLSS) is a major cause of low back pain, lower extremity discomfort and disability in the elderly. Surgical treatment is considered to improve function and comfort in these patients. Purpose of this retrospective study was to analyze our indications, preoperative evaluation protocol, surgical technique and moderate term clinical results after decompressive surgery alone and combined with both instrumented and noninstrumented arthrodesis in DLSS.

Methods: 59 patients (18 male, 41 female) with an average age of 62.4 (35-85) years were evaluated. Levels of decompression varied between T12-S1. One level was decompressed in 14, 2 levels in 15, 3 levels in 13, 4 levels in 8, 5 levels in 9 patients. The extent of decompression was determined mainıyon clinical symptoms and radiologic findings (plain X-rays, dynamic myelography, myelo-CT and MRI). Surgical treatment consisted of decompression alone in 2 (3 %), noninstrumented arthrodesis in 3 (5 %) and instrumented arthrodesis in 54 (92 %) patients. Titanium mesh cages at varying levels (1 to 4) were used in 19 patients for anterior structural support. 14 (23 %) patients also had either spondylolysis or degenerative spondylolisthesis.

Results: Average follow-up was 38 (24-96) months. At final follow-up all patients underwent physical and radiologic examination and were given an interview. Overall satisfaction according to criteria developed by Japanese Orthopaedic Association was good or excellent in 50 (85 %) patients and fair or poor in 9 (15 %) patients. There was relatively high percentage (25 %) of intraoperative and early postoperative complications (3 deep, 1 superficial wound infection, 2 sterile wound drainage due to allograft, 5 dural tears, 2 transient nerve root paralysis, 1 haematoma and 1 pseudarthrosis) which were all successfully managed. Reoperation was done in onlyone patient for dural tear repair. Sciatica was the symptom most frequently relieved and back pain was the most frequently persisting symptom after operation.

Conclusion: Decompressive surgery with instrumented and noninstrumented arthrodesis for degenerative spinal stenosis appears to be beneficial, at least in the short or moderate term, for many patients in reducing pain and increasing function but associated with a high rate of complications probably due to relatively advanced age and current comorbidities of the patients and mainly low lumbar location of the surgical field.

ORAL PRESENTATIONS

RESULTS OF SURGICAL TREATMENT FOR DEGENERATIVE CERVICAL MYELOPATHY

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Introduction: Degenerative lumbar spinal stenosis (DLSS) is a major cause of low back pain, lower extremity discomfort and disability in the elderly. Surgical treatment is considered to improve function and comfort in these patients. Purpose of this retrospective study was to analyze our indications, preoperative evaluation protocol, surgical technique and moderate term clinical results after decompressive surgery alone and combined with both instrumented and noninstrumented arthrodesis in DLSS.

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ORAL PRESENTATIONS

TRANSPEDICULAR DECANCELLATION OSTEOTOMY IN THE TREATMENT OF PERIDURAL FIBROSIS

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Purpose: To asses the surgical treatment choice of transpedicular decancellation osteotomy for peridural fibrosis accompanied by lumbar kyphosis or hypolordosis.

Patients and Methods: From 1992 to 1997 a series of 12 multiply operated (averaging 2.5 previous operations) patients with recurrent peridural fibrosis and postlaminectomy kyphosis underwent surgery at our clinic. The surgery was designed to restore the physiological lordosis, relax tethered cord and epidural veins by transpedicular decancellation osteotomy at a vertebra other than the vertebra with peridural fibrosis.

This paper presents the long-term functional outcome of these 12 patients. Clinical assessments were conducted pre-operatively and at 3-month intervals postoperatively and included X-ray assessment and the assessment of functional status of the patients by Oswestry Disability Index (ODI) and of pain by Visual Analogue Scale (pain VAS).

Results: All symptoms and the pain due to peridural fibrosis disappeared in the early postoperative period. Patients had lower disability and pain scores at their early and long-term follow up (follow-up period 24-74 months, mean 36.3 months).

Conclusion: In-patients with failed medical therapy for peridural fibrosis accompanied by lumbar kyphosis or hypolordosis, transpedicular decancellation osteotomy should be the surgical treatment of choice.

ORAL PRESENTATIONS

THE INFLUENCE OF VERTEBRAL INSTABILITY ON PERIDURAL CIRCULATION IMPAIRMENT AND CONCOMITTANT PERIDURAL FIBROSIS FORMATION

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Purpose of the Study: To prove the hypothesis that the vertebral instability is the main cause of impaired peridural venous circulation which leads to peridural fibrosis formation.

Significance: In cadaveric studies of nonoperated spines there is a significant relationship between the peridural venous obstruction and the peridural fibrosis. The vascular damage is significantly related to the severity of degenerative spine. The association between vascular compression, tissue fibrosis, and endothelial injury distant from the compression may be a causal-probably due to ischemia as a result of reduced venous outflow.

Animals and Methods: Five experimental groups (IS1, IS2, IN1, IN2, Control) comprised 50 skeletally mature male rabbits. The L2-L4 segment was used in all surgical groups. Vertebral instability was created by removal of the interspinous ligament, spinous process, tranverse process and the facets between L2-L3 and L3-L4. In control group only the laminae of L2-L3-L4 were exposed. The rabbits in IS1 and IS2 groups were applied a repetitive extension-flexion movement through electric stimulation of the paravertebral muscles (The EMS 8000TM Electrical Neuromuscular Stimulator-intervertebral motion device for dynamic motion at sagittal plane).The lumbar spine movement was controlled within physiologic range by adjusting the voltage of the signal. The frequency of stimulation was 5 cyclesimin, and the average time of loading was 10 hr/day. Rabbits in the IS1 and IN1 were killed at postoperative 5th day for the immunohistochemical evaluation for early vascular changes. The rabbits in the IS2, IN2 and the control group were killed at postoperative 3rd week for the histopathological evaluation of peridural fibrosis formation. The vascular changes and the vessel density were evaluated quantitatively.

Results: There was no significant difference between vascular changes and the vessel density at IS 1 and IN2. When the peridural fibrosis formation was evaluated, the rabbits at IS2 had more extensive fibrosis formation compared to the IN2 and the control groups.

Conclusion: Vertebral Instability is an important cause of Peridural Fibrosis. In early phase vertebral instability doesn't effect peridural circulation.

ORAL PRESENTATIONS

THE RETRODIAPHRAGMATIC SPINAL APPROACH; LEAVING THE THORACIC CAVITY INTACT

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With advances in surgical technique and instrumentation, the anterior approach to the thoracolumbar spine becomes more popular. Anterior approach is considered particularly when ventral decompression of neural structures is needed, providing optional stability by fusing the involved segment with instruments specially designated for that purpose. The usual approach is done through a 10th or 11th rib thoracotomy, opening of the pleural cavity and a semilunar cut at the periphery of the diaphragm, in order to expose the antero-lateral aspect of the vertebral column. This technique involves the risk of phrenic nerve injury and diaphragmatic paralysis combined with morbidity of the chest tube. A variant of that technique is the retrodiaphragmatic approach, which provides the surgeon with the advantages of ventral exposure, potentially avoiding the morbidity of the standard transpleural thoracotomy.

Methods: During a three year period, all patients with major anterior pathology at the T11, T12 or L1 level, were operated using the retrodiaphragmatic anterior approach. This involved an 10th or 11th rib thoracotomy. Following rib resection, blunt dissection of the diaphragm from the chest wall was performed without its surgical incision. The parietal pleural was mobilized medially and left intact and the thoracolumbar spine was exposed for the procedure. In case of a major pleural defect, a chest drain was inserted.

Results: The study group included fifteen patients, 10 males and 5 females, mean age: 32.6y. Six patients had a thoracolumbar fracture, five patients had idiopathic scoliosis and four patients presented with metastatic disease in the thoracolumbar region. Adequate decompression was achieved in all patients as well as stable fixation of the involved segment. Mean operating time was 4.5 hours. Three patients (20%) required a chest drain following the procedure. In five cases (40%) blood transfusion was required, mainly for the underlying disease. The average decrease in the hemoglobin values, in the patient subgroup not requiring blood transfusion, was 3mg at discharge comparing to the preoperative level. No intra-operative complications related to the surgical technique or instrumentation, were noted, nor any case of mortality. Complications such as respiratory distress, neurological damage, infection, hardware loosening or failure, pseudoarthrosis or hernia in scar were not observed during the post operative follow-up.

Conclusion: The retrodiaphragmatic approach to the thoracolumbar spine is safe and technically easy to apply in cases where ventral exposure of the spine is needed. This technique spares the need for diaphragmatic incision and in most cases, leaves the pleural cavity intact.

ORAL PRESENTATIONS

AN ANALYSIS OF ALL SPINAL FUSIONS IN THE STATE OF CALIFORNIA FROM 1995 TO 1999

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Introduction: Spinal fusion is a surgical procedure used to treat a myriad of pathological conditions. The present study was an attempt to broadly describe the patient population, most comman disorders treated, associated outcomes, and trends over time for this procedure by analyzing five years of a large statewide hospital discharge database.

Methods: The California Office of Statewide Health Planning and Development (OSHPD) hospital discharge database was used to identify 92,372 discharges coded as spinal fusions (ICD-9 proeedure code) from 1995 to 1999. This collection of cases was examined to describe patient and provider trends.

Results: For all spinal fusions, there were 337 deaths (mortality rate=O.4%). The mean Length of Stay (LOS) was 5.3 days (SD=7.4), and mean hospital charges were $40,713.25 (SD=51,676.01). The mean age of these patients was 48.6 years old (range=94). There were equal numbers of male and female discharges. Race data revealed that 86.2% of patients were white, 5.2% were black, 2.7% percent were Asian or Pacifie Islander, 0.4% were Native American, 4.4% were of an other race, and 1.2% were of un known race. Ethnicity data revealed that 10.6% of patients were Hispanic, compared to 86.8% non-Hispanic and 2.6% unknown ethnicity. The 10 most comman primary diagnoses associated with spinal fusions were displacement of intervertebral dise without myleopathy (29.6%), spondylosis (14.2%), degeneration of intervertebral disc (10.4%), spondylolisthesis (8.1%), spinal stenosis (6.2%), complication of orthopaedic device (5.6%), intervertebral disc disorder with myelopathy (5.5%), fractures of the vertebral column (4.5%), scoliosis (4.4%), and post-laminectomy syndrome (2.1%). There was a 39.5% inerease in the number of spinal fusions from 1995 to 1999, and this was largely a reflection of increased proportion of anterior lumbar fusions, which increased by 201.3% over the 5-year span. Hospital charges increased 34.0% over this period, and this was not a function of LOS, which remained constant. There was a large spread in hospital volume, as 36.9% of facilities performing fusions had a volume of 10 or less per year, while 20.0% of facilities performed 100-500 fusions per year. Hospitals with an annual volume of 10 or less fusions per year had a significantly higher mortality rate than hospitals with an annual volume of 100 or more ($p<0.05$).

Discussion and conclusions: The present analysis represents one of the largest collections of spinal fusions described and provides insight into a number of patient and provider patterns. Our data reveals that patients receiving fusions represent adverse group both with respect to demographics and spinal pathology. Recent advances in instrumentation, diagnostic imaging, and perioperative care may explain the increases in the number of spinal fusions and in mean hospital charges over this period of study. The large number of centers performing fewer than 10 spinal fusions annually is particularly striking. The disparity between mortality rates in high versus law volume centers is suggestive of a volume outcomes relationship for spinal fusian operations and warrants a more detailed examination of this phenomenon.

ORAL PRESENTATIONS

CORRELATION BETWEEN PAIN, PELVIC LATERAL SHIFT AND POSITIVE WALK TEST IN SACROILIAC JOINT DYSFUNCTION

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Objective: A departure from the midline causing lateral shift or a lumbar scoliosis is evident in about; 2 % of low back patients. There are many reasons for the lumbar spine to depart even slightly from the midline because of some biomechanical problems in lumbosacral region such as pelvic rotation, pelvic obliquity or sacroiliac dysfunction.

The aim of the study was to determine the relationship among pelvic lateral shift and positive walk test which is a manual dynamic test for sacroiliac joint dysfunction.

Methods: Between 2000-2002, 30 patients suffered from sacroiliac joint dysfunction participated in this study. The patients with an average 38.8 years old were 21 female and 9 male. Presence of pain on affected sacroiliac joint using with side-glide test was noted. Walk test which is a special test for sacroiliac joint was performed by asking the patient to flex alternate hips on standing position. Pelvic lateral shift was tested in standing with anterior and posterior observation.

Results: The patients with sacroiliac dysfunction showed significant relationship between positive walk test and pelvic lateral shift (r = 0.38). The pain on affected sacroiliac joint was significantly correlated with positive walk test (r = 0.49).

Discussion and Conclusion: Mechanical deformation in lumbo-pelvic region increases incidence of lateral shift and may cause pain on related segments which may effect. These results will be a guide for treating the patients with sacroiliac joint dysfunction. It can be concluded that correction of the pelvic asymmetry may help relief of pain and restoring of sacroiliac joint mechanics in sacroiliac joint dysfunction.

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ORAL PRESENTATIONS

CLINICAL FOLLOW-UP OF A NEW IMPLANT SYSTEM FOR POSTERIOR CERVICAL SPINE INSTRUMENTATION

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Purpose of Study: The use of rod-screw systems improved posterior instrumentation of the cervical spine significantly due to optimal screw position adapted to the individual anatomic situation. A new modular rod-screw implant system was developed with improved biomechanical properties and cannulated cervical screws. The aim of this prospective clinical study was the clinical evaluation on the new implant system.

Methods Used: 38 consecutive patients with post. occipito-cervical or cervical instrumentation with the new implant system operated by one surgeon were evaluated prospectively after a minimum one year follow-up. Indications were instabilities due to rheumathoid arthritis in 10 patients, cervical spinal stenosis in 5 patients, implant failure with non-union in 4 patients, dens non-union in 4 patients, dens # in 3 patients, congenital malformations in 3 patients, cervical spine fractures with ancylosing spondylitis in 3 patients, rupture of the alar ligaments in 2 patients, locked fracture dislocations in 2 patients and iatrogenic instabilities in 2 patients. In 10 patients the occiput was included in the instrumentation, in 16 patients 88 pedicle screws and in 26 patients 52 transarticular screws C1/2 were used. The mean follow-up interval was 15.8 months (12-28), mean age at operation was 53.7 years (19-92). Evaluation included radiological, neurological and clinical follow-up.

Summary of Findings: No implant related complications were observed. One instrumentation-related complication was observed due to a broken k-wire tip during transarticular C1/2 instrumentation with cannulated screws and a 1.5 mm k-wire with threaded tip. After changing to non-threaded k-wires no more k-wire breakages occurred. No neurological or vascular complications were found related to pedicle screws as well as transarticular C1/2 screws. The malplacement rate of the pedicle screws was 11 % (10 screws) and in all cases below 2 mm displacement without any neurological or vascular complications, no malplacement of transarticular C1/2 screws was found. Instrumentation with the new system was possible in all cases as planned preoperatively. During the follow-up period no non-union or implant failure was observed.

Relationship Between Findings and Existing Knowledge: This is the first report on the clinical evaluation of neon - a new modular rod-screw implant system for posterior instrumentation of the cervical spine.

Overall Significance of Findings: This study showed that posterior instrumentation of the cervical spine using the new neon occipito-cervical system is versatile and has proven to be both safe and efficient.

ORAL PRESENTATIONS

A COMPARISON OF MCKENZIE'S MANUAL THERAPY APPROACH AND TRADITIONAL PHYSIOTHERAPY IN PATIENTS WITH ACUTE AND SUBACUTE BACK PAIN

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Objective: The McKenzie's manual therapy system is a commonly used approach of examining and treating patients who have low back pain, yet there are not enough studies on it with controlled trials. The purpose of this study was to compare the effects of spinal manual therapy using by McKenzie's System and Iraditional physical therapy in patients with acute and subacute low back pain of herniated disc disease.

Methods: From 1998-2001, a total of 95 patients suffered from L5- S1 disc herniation in acute subacute stage included in the study. The patients were assigned to one of two groups: a manual therapy group (n= 43) and traditional physical therapy group (n= 52). Their mean age was 41.7± 2.1 for the manual therapy group (34 female, 9 male) and 44.7±12.4 for the physical therapy group (33 female, 19 male). The patients in the manual therapy group were treated by using McKenzie Diagnosis and Treatment System. Traditional Physical Therapy for physical therapy group included hotpack, ultrasound, TENS and exercise. Pain intensity strength of trunk extensor and flexor muscles and functional level were evaluated before and after the treatment.

Results: At the end of the study, all the patient in both groups showed significant improvement in all parameters ($p< 0.05$). Pain level in the manual therapy group diminished dramatically in a short duration in comparation with the physiotherapy group. The manual therapy group showed less pain and less restricted range of movement pain free movement than the physical therapy group. Functional level was higher ($p<0.05$) in manual therapy group than physical therapy group.

Discussion and Conclusion: These results agree with the positive effects of spinal manipulative therapy on pain, pain free movements and disability rating reported in other studies.

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