ACTA
ORTHOPAEDICA
et
TRAUMATOLOGICA
TURCICA

Acta Orthop Traumatol Turc 2004;38(2):136-144

Low back pain among children and adolescents

Çocuk ve adölesanlarda görülen sırt ve bel ağrıları

Murat BEZER, Bülent EROL, Barış KOCAOĞLU, Nuri AYDIN, Osman GÜVEN

Department of Ortopedics and Traumatology, Medical Faculty of Marmara University

Amaç: Çocuklarda sırt ve bel ağrısının tanı ve tedavisi konusunda deneyimlerimizi sunmak.

Çalışma planı: Sırt ve bel ağrısı nedeniyle tedavi ettiğimiz ve düzenli takipleri yapılan 29 çocuk hasta (15 kız, 14 erkek; ort. yaş 12; dağılım 9-17) geriye dönük olarak incelendi. Etyolojiye yönelik çalışmalarda klinik inceleme, radyolojik inceleme ve laboratuvar testlerine başvuruldu. Bu araştırmalar sonucunda belirli bir nedenin saptanamadığı olgularda semptomatik tedavi uygulandı. Ortalama izlem süresi 42 ay (dağılım 12-96 ay) idi.

Sonuçlar: Yirmi altı hastada (%89) sırt-bel ağrısının nedeni belirlendi. Tanılar, spondilolizis/spondilolistezis (n=8), Scheuermann hastalığı (n=6), neoplazi (n=5), diskit/vertebral osteomiyelit (n=4) ve lumbar disk hernisi (n=3) şeklindeydi. İzole spondilolizisli yedi hastaya konservatif tedavi; spondilolistezisin eşlik ettiği bir hastaya in situ füzyon uygulandı. Scheuermann hastalığı olan bir olguya spinal füzyon yapıldı; diğer olgular konservatif olarak izlendi. Neoplaziler, konservatif tedavi uygulanan bir hasta dışında, biyopsi, küretaj ve greftleme yöntemleriyle tedavi edildi. Diskitli iki hastaya antibiyotik tedavisi; vertebra osteomiyelitli iki olguya (Pott apsesi) tıbbi tedaviye ek olarak, drenaj ve strut greftle stabilizasyon uygulandı. Disk hernili bir hastaya disk fragmanlarının eksizyonu ve sınırlı laminektomi, iki hastaya konservatif tedavi uygulandı. Hastaların tümünde tam klinik iyileşme sağlandı.

Çıkarımlar: Çocuklarda geçmeyen sırt-bel ağrıları ciddiye alınmalıdır. Bu ağrılar iyi bir öykü ve fizik muayene, radyolojik inceleme ve laboratuvar testleriyle değerlendirilebilmekte ve uygun tedaviyle iyileşme sağlanmaktadır.

Anahtar sözcükler: Adölesan; sırt-bel ağrısı/etyoloji; fizyopatoloji; rehabilitasyon/tedavi; çocuk; lomber vertebra/fizyopatoloji; lumbosakral bölge/fizyopatoloji.

Objectives: We presented our experience with the diagnosis and treatment of low back pain in children.

Methods: We retrospectively reviewed 29 children (15 girls, 14 boys; mean age 12 years; range 9 to 17 years) who were treated for low back pain and had appropriate follow-ups. Etiologic causes were sought by clinical evaluation, radiologic studies, and laboratory tests. Patients with unknown etiology underwent symptomatic treatment. The mean follow-up period was 42 months (range 12 to 96 months).

Results: Etiology was determined in 26 patients (89%), which included spondylolysis/spondylolisthesis (n=8), Scheuermann's disease (n=6), neoplasia (n=5), discitis/vertebral osteomyelitis (n=4), and lumbar disc herniation (n=3). Spondylolysis was managed conservatively, except for one patient who had in situ spinal fusion for associated spondylolisthesis. Five patients with Scheuermann's disease were treated conservatively, while one patient required spinal fusion. Surgical treatment with biopsy, curettage, and bone grafting was performed for all neoplasias, but one which was followed-up conservatively. Two patients with discitis were managed with antibiotic treatment and two patients with vertebral osteomyelitis (Pott's abscess) underwent both medical treatment and surgical drainage and stabilization with strut graft. Lumbar disc herniation was treated conservatively in two patients, while one had surgical treatment with excision of disc fragments and limited laminectomy. Finally, all the patients became asymptomatic on final examinations.

Conclusion: Serious consideration should be given to persistent low back pain in children. Clinical, radiologic, and laboratory findings can be elaborated into etiologic diagnoses and complete relief can be achieved with appropriate treatment.

Key words: Adolescent; low back pain/etiology/physiopathology/rehabilitation/therapy child; lumbar vertebrae/physiopathology; lumbosacral region/physiopathology.

Correspondance to: Bulent Erol, MD. Department of Orthopedics and Traumatology, Medical Faculty of Marmara University
Tophanelioglu Cad. No:13/15, 34662 Altunizade, Istanbul.
Phone: 0216 - 325 45 82 Fax: 0216 - 325 45 82 e-mail: bulerol@hotmail.com
Received: 17.11.2003 **Accepted:** 08.04.2004

Low back pain is very rare in children under 10 years old, and the symptom is usually associated with an underlying organic pathology. Its incidence gradually increases with age during adolescence, which in turn makes it harder to isolate the etiology as it is in the adults. Due to its rare occurrence, many orthopaedic surgeons have limited experience in such cases. Thus, low back pain during childhood usually goes unnoticed and the underlying pathology cannot be diagnosed. [1-4] The common causes of back pain in children include spondylolysis/spondylolisthesis, Scheuermann's disease, neoplasias, lumbar disc hernia, and diskitis/vertebral osteomyelitis (Table 1). [1,3]

The present study retrospectively reviewed the children, who applied to our clinic with complaints of low back pain, and underwent treatment and appropriate follow-up after the determination of underlying etiology. We reviewed the treatment methods used, based on our experience related to this rare problem, and we decided that a literature search representing the main issues on the diagnosis and treatment would be helpful to define the related pathologies and classify the appropriate treatment methods.

Patients and method

We retrospectively reviewed 29 children (15 girls, 14 boys; mean age 12 years; range 9 to 17 years), who were treated for low back pain and had appropriate follow-ups, out of 110 children who applied to our Ortopedics and Traumatology Clinic with complaints of low back pain between March 1996 and July 2002. Eighty-one patients (64.5%) who lacked consistent follow-up were excluded.

Thorough history and physical examination, radiology and laboratory tests were the methods used to find out the etiology of the low back pain. Particularly severity, persistence, frequency, duration, origination, location/distribution of the pain and concomitant symptoms were investigated during the history examination. The patients were asked whether the pain was persistent or intermittent; if intermittent they were then asked about the frequency. They were also asked about the types of activities (resting, medicine consumption), which either reduced or amplified the pain. They were also asked whether they had to interrupt a specific activity because of the pain, and whether they had resting or midnight pain after being awoken from night sleep. How the pain started – an acute origin accompanying a specific trauma or a new sportive activity (specifically swimming, diving) or a chronic, insidious course- was questioned. Though it was difficult with the younger ones, children were asked to describe the location of the pain, and checked if the pain was radiated into the lower extremity.

Upon identification of the pain, concomitant changes in the posture and gait, and specific neurological symptoms (insensibility, weakness, bladder or intestinal dysfunction, etc.) were examined. And, presence of systemic findings such as fever, loss of appetite or several environmental stresses (problems related with family/school) was explored.

Table 1. Causes of lower back pain in children

1. Mechanical problems
    a. Postural problems
    b. Muscular problems
        - Overuse syndromes
    c. Hernia nucleus pulposus
    d. Slipped vertebral apophasis
2. Developmental abnormalities
    a. Spondylolysis/spondylolysthesis
    b. Scheuermann's disease
3. Inflammatory conditions
    a. Diskitis/vertebral osteomyelitis
    b. Intervertabral disk calsification
    c. Rheumatoid disorders
        - Ankylosing spondylitis
        - Juvenile rheumatoid arthritis
4. Neoplastic disorders
    a. Vertebral column
        - Osteoid osteoma/osteoblastoma
        - Aneurysmal bone cyst
        - Hystocytosis with Langerhans cell (eosinophilic granuloma)
        - Leukemia/lymphoma
        - Ewing sarcoma
        - Metastasis
    b. Spinal cord/canal
        - Spinal cord tumors
        - Meningeal/epidural tumors
    c. Muscle
        - Rabdomyosarcoma
5. Psychological conditions

During the physical examination, first of all, the gait balance of the patients was observed, determining the presence of any walking disorder, which was followed by a thorough vertebral examination. Also assessed were the presence of any coronal and/or sagittal plane deformity (scoliosis, kyphosis, kyphoscoliosis, etc.), and vertebral balance, level of shoulders and pelvis (in terms of disproportionate right and left shoulder levels and pelvic deviation). The length of the lower extremities was recorded. In order to reveal pressure from the neural stem, radiation into the lower extremities was examined by hold-the-legs-straight test, which was followed by a thorough neurological examination, and deep tendon reflexes and motor and sensational functions –restricted in younger children- were also assessed. Furthermore, presence of abdominal reflex and its symmetry were checked for each patient.

Following a thorough history and physical examination, all patients underwent radiographic studies after the evaluation of possible diagnoses. The posteroanterior and lateral views of the complete vertebral column were obtained for each patient; presence of any vertebral deformity or a lesion fusing the vertebrae (vertebra corpus or posterior elements) was confirmed; and in order to eliminate the presence of widespread osteophenia, the bone intensities of the vertebrae were inferred. Further radiological testing was required according to the clinical profile of the patient when the radiographies were normally inferred or in order to define pathology found in the graphy better. Computed tomography (BT) (spondylolysis/spondylolysthesis, neoplasia), magnetic resonance imaging (MRG) (lumbar disk hernia, diskitis/vertebral osteomyelitis, neoplasia) and bone sintigraphy (spondylolydis, neoplasia) were conducted.

When infection was suspected, presence of lycocytosis, erytrocyte sedimentation rate (ESR) and C-reactive protein (CRP) level were assessed to further support the diagnosis. Furthermore, in some cases, rheumatological analysis (rheumatoid factor, HLA-B27, antinuclear antibodies) was conducted to confirm the diagnosis.

Results

The clinical (history and physical examination) and radiological studies exposed etiology in 26 patients (89%) while it was not possible to define the cause of low back pain in three patients (11%). The etiologies were spondylolysis/spondylolysteis in eight, Scheuermann's disease in six, neoplasia in five, diskitis/vertebral osteomyelitis in four, and lumbar disk hernia in three patients. Treatments were planned accordingly. Twenty patients (69) received conservative therapy while 9 patients (31%) underwent surgical operation (Table 2).

The radiographies were sufficient for diagnosis in almost half of the patients with spondylolysis/spondylolystesis (in addition to history and physical examination), and the diagnosis was supported by bone sintigraphy and/or BT for the rest (Figure 1). Eight patients (5F/3M) were diagnosed with spondylolysis/spondylolystesis; the disease was isolated in seven of them (L5 spondylolysis) and treated conservatively. The complaints of five patients were relieved in 6 to 8 weeks by rest, activity modification (restriction of activities) and a conservative therapy program including non-steroidal anti-inflammatory drugs (NSAIDs) or mild analgesics. Two patients used antilordotic corset (Boston type with open front module) for a period of 6 to 8 weeks due to the persistence of pain; and two patients became completely asymptomatic. As the pain remarkably decreased, patients were allowed to gradually increase their level of activity.

Table 2. Distribution of patients based on diagnosis and treatment method

Diagnosis	Conservative treatment	Surgical treatment	Total
Unknown etiology	3	0	3
Spondylosis/spondylolystesis	7	1	8
Scheuermann kyphosis	5	1	6
Neoplasia	1	4	5
Diskitis/vertebral osteomyelitis	2	2	4
Lumbar disk hernia	2	1	3
Total	20 (%69)	9 (%31)	29 (%100)

Physical treatment exercises were also recommended to increase the abdominal-paraspinal muscle tonus. Those patients achieved full activity level within 3 to 6 months following the diagnosis, and usually returned to sportive activities by the sixth month. Until their vertebral growth was complete, the patients were asked to have annual tests, undergoing radiographical examination for spondylolysis; none of them had progression in the latest controls. The controls still continue in four patients whose vertebral growth is not complete yet. In one patient who was transferred from another center due to resistant low back pain, the L5 spondylolysis was concomitant with spondylolystesis (L5 -S1; Grade 1). This patient underwent in situ fusion (bilateral, L5 –sacrum) using autolog bone graft. He wore a corset for a period of three months after the operation; and he was able to return to full sporting activity at the end of the first year.

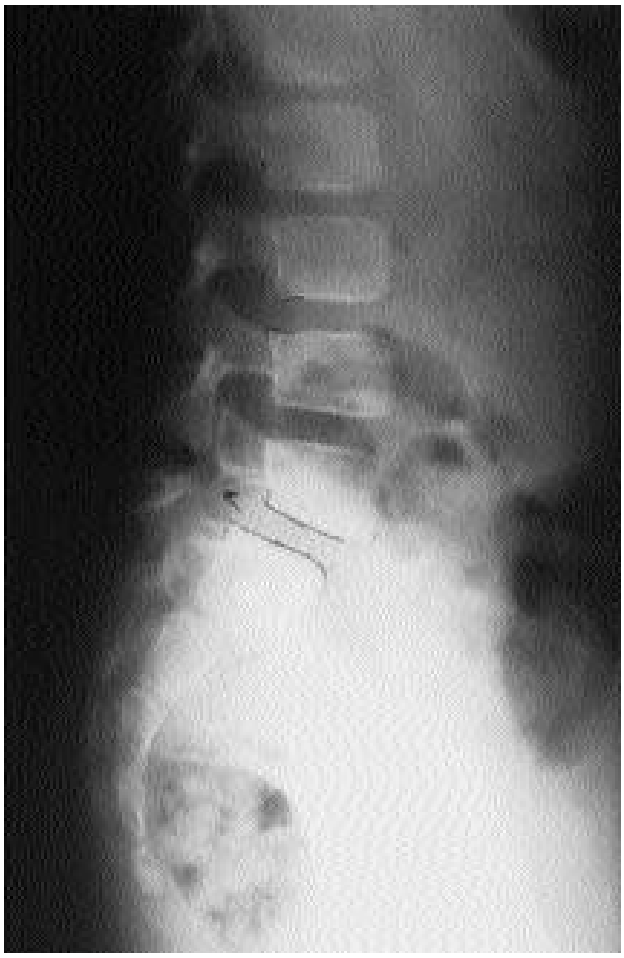

Figure 1. A radiolucent defect in the parsinterarticularis is seen in the lateral lomber vertebragraphy of this 12-years-old male patient with L 5 spondylolysis and Grade 1, L5-S1 spondylolysthesis. It is evident that the L5 vertebra corpus has slipped toward the anterior. The patient underwent in situ fusion (L5-S1).

The diagnosis of neoplasia in five patients (3F/2M) included eosinophilic granuloma (2), aneurysmal bone cyst (2) and osteoid osteoma (1). Several imaging methods were used in addition to the radiographies for the identification of these lesions. The subordinate inspections supportive in the diagnosis were full body bone sintigraphy and MRG in the eosinophilic granuloma; MRG and BT in the aneurysmal bone cyst; and BT in the osteoid osteoma (Figure 3; Figure 4a, b). Additionally, abdominal ultrasonography was taken in order to eliminate any systemic involvement in the patients with possible eosinophilic granuloma. These patients underwent clinical and radiological monitoring or biopsy, and surgical interventions including curettage and grafting in accordance with the diagnosis considered. One of the two patients with vertebra plana (single-level involve-

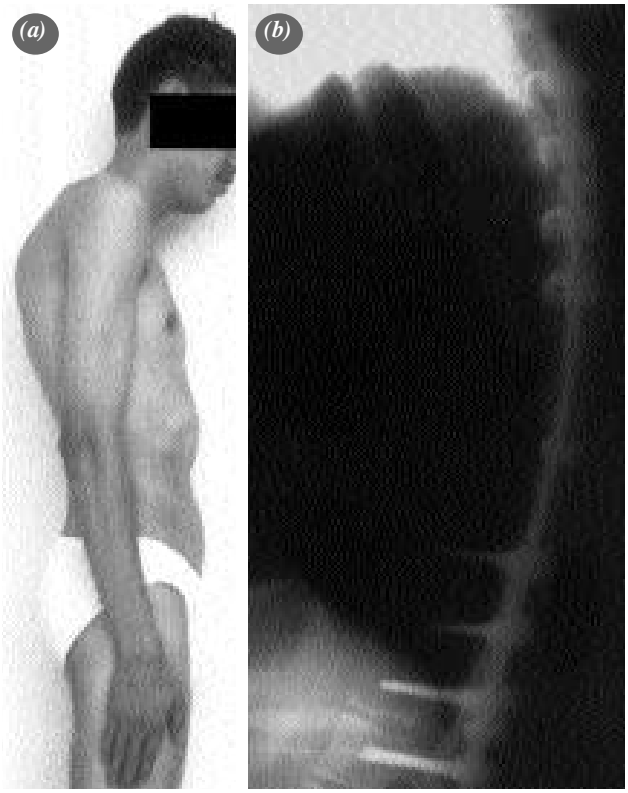

Figure 2. Advanced kyphotic deformity is seen in the thoracic area **(a)** of this 16-years-old male patient diagnosed with Scheuermann's kyphosis. **(b**) This patient underwent posterior fusion and instrumentation.

ment; thoracal in one patient and lombar in the other) and prediagnosed with eosinophilic granuloma was monitored conservatively while open biopsy was performed for the other one just to confirm the diagnosis. The radiographic follow-up studies showed that the restructuring of the vertebra corpus heights still continued. In the thoracal level, curettage and autogenius bone grafting were performed in two cases with aneurysmal bone cysts binding the posterior elements while an osteoid osteoma was treated by intralesionel curettage. No spinal instrumentation was performed in any of the operations. The diagnosis of all cases was confirmed by pathological analysis. Full symptomatic relief was achieved after the operation in these patients; no recurrence was observed during the follow-up.

Clinical findings, radiological analyses (radiography, MRG) and laboratory tests (ESR, CRP) were all used for the diagnosis of spinal infections. Two patients (2F), diagnosed with discitis, received rest and parenteral antibiotics therapy (cephasoline) for four weeks. Before any biopsy procedure, these patients received treatment for Staphylococcus aureus; it was considered S. aureus sensitive to metycilline since the patients were diagnosed at the polyclinic. Both patients responded well to the treatment during the 2nd and 3rd weeks, and the clinical appearance improved. Reproduction was observed in the blood culture of the patients. Two patients (1F/1M) with vertebral osteomyelitis-Pott abscess underwent drainage and strut grafting (structural allograft was used in one patient, and her own fibula in the other) by anterior intervention, followed by pelvipedal cast. Postoperatively, they received antituberculosis treatment (quadruple treatment - isoniaside, riphampine, pirazinamide, streptomycine) for two months; and

Figure 3. The image of a classical vertebra plana in the anteroposterior lumbargraphy of a 12-years-old male patient with a lumbar (L4) vertebra involvement due to eosinophilic granuloma. No surgical intervention was performed in this lesion; it was conservatively treated.

Figure 4. An expansile lesion is seen in the analysis of the computed tomography **(a)** of the thoracal vertebra of the 12 years-old girl with thoracal vertebra involvement due to aneurysmal bone cyst, which led to lessening in the laminar cortex in the vertebra level. **(b)** The magnetic resonance imaging provides liquid-liquid levels. This lesion was treated by curettage and grafting.

subsequently a double treatment consisting of izoniaside and riphampine for 12 months. The active microorganism (Mycobacterium tuberculosis) was isolated in both cases. The course of improvement in the clinical appearance was a little slower, and no recurrence was observed.

The lumbar disk hernia was diagnosed (using)by MRG in all patients (1F/2M). The complaints in two patients were relieved by conservative therapy including restricted activities and analgesics while the others underwent surgical treatment through excision of disk fragments and limited posterior laminectomy. The complaints were also relieved in three patients within 6 to 8 weeks. They returned to full activity and sports around the sixth month.

Three children (1F/2M) with undetermined etiology in spite of history and physical examination, radiological and laboratory analyses received symptomatic treatment. Their activities were modified and restricted; and, they received mild analgesics (or NSAIDs). Once a remarkable relief was observed in the pain of all patients after 6 to 8 weeks, they were allowed to increase their activity levels accompanied with a physical program strengthening the abdominalparaspinal muscles. The children achieved full activity around the sixth month, returning to sportive activities.

Discussion

During childhood, the most common low back pain with known etiology, results from spondylolysis. The emergence of symptoms is associated with rarely known severe trauma; but it may develop from recurrent traumas. Spondylolysis usually develops with sportive activities which require constant hyperextension of the lumbar spine (gymnastics, diving, weightlifting).[1-4] The patients usually suffer from low back pain, and indicate that it is relieved by rest and restriction of activities. During the physical examination, usually there is sensitivity in the L5-S1 level, and the severity of the pain increases by forcing the extension.[1-4] Radioluscent defect is evident in the pars interarticularis using conventional radiograpy; however, oblique views may be required in order to visualize the small defects (Figure 1). In case the radiographic findings are normal, sintigraphy may indicate the region with increased activity.[1,2,5] The objectives of the treatment are to resolve the symptoms, prevent any formation of spondylolysthesis and enable return to previous activity levels. The initial treatment includes rest, modification of activities and mild analgesics. When the pain persists, use of an anti-lordotic corset may be effective.[5] As the pain is relieved, the patients gradually return to their daily activities. Physical therapy is helpful in regaining the range of motion and enhancing the abdominalparaspinal muscle tonus.[5]

Surgical treatment can be employed if the pain reoccurs and reaches an uncomfortable level.[5] The children whose findings were found to improve, should periodically be monitored by radiographies (spot lateral lumbosacral composite views while standing) even though they are asymptomatic during their growth, and they should be checked for any progress in spondylolysthesis.[1-4] Progress is very rare in children over 10 years old; and it is already present in most of the cases when their first radiographies are taken (Figure 1).[1-4] The standard surgical treatment for L5 spondylolysis is bilateral in situ fusion, using the autolog bone graft of the L5 sacrum.[1-3,5] Internal fixation was not proven to provide any benefit during adolescence. Postoperative immobilization is usually done by corset. Generally full activity and sports shouldn't be allowed before the end of the first year (before the maturation of the fusion) following the surgery. And, grafting and internal fixation of the defect in the pars are recommended for the isolated spondylolysis of the L4 or upper levels (without the presence of remarkable spondylolysthesis).[1-3,5] In our study, most of the patients with spondylolysis responded well to the conservative treatment modalities. One patient with a chronic low back pain that progressed into spondylolysthesis was successfully treated by surgery.

The children with Scheuermann's disease complain about their appearance rather than the pain. [6] Persistence of the kyphotic deformity when the patient is lying on his or her back makes it easy to distinguish it from postural kyphosis. The kyphosis is located in the thoracic region in 75% of the patients and in the thoracolumbar composite in

25%, and rarely in the lumbar level (Figure 2a). [1,6] The pain is located in the apex of the slippage; it usually increases by long-lasting sitting, standing and physical activity. The diagnosis is based on wedging over 5 degrees in three subsequent vertebrae, irregularity or growth disorder confirmed by lateral views.

In children with Scheuermann's disease, pain-oriented mild analgesics, restriction of activities and extension exercises are given. Rarely in cases where the kyphosis is very evident (>50º) and the pain exists, use of corset may be required during the follow-up. Spinal fusion is required if the deformity keeps progressing (Figure 2b). In our study, we treated the low back pain and deformity by conservative methods in most of the patients with Scheuermann's disease; only one patient underwent surgical treatment for chronic pain and progressive deformity.

Spinal tumors are rare in children, and most of them have benign characteristics. Osteoid osteoma and osteoblastoma are very common; and they are followed by aneurysmal bone cyst and eosinophilic granuloma.[1,7] Osteoid osteoma typically causes a localized low back pain, which becomes more severe during the night and is relieved by NSAIDs. Concomitant and unstructured scoliosis are frequent. The views may demonstrate sclerosis in the posterior elements; however the best diagnosis can be obtained by bone sintigraphy and BT analyses of the thin-section (1-1.5 mm) in the region with increased activity.[1,7] Those lesions are generally operated on; the objective is to perform a local excision (intralesional curettage) so as to maintain the tissue normality as much as possible without leaving any residue. Use of high-speed burr is effective.[1,7]

Eosinophilic granuloma may present with vertebral involvement, particularly in youngsters. [8] There is non-specific low back pain, and classical vertebra plana image in the views (Figure 3). Bone scan or entire body bone sintigraphy is helpful in evaluating the presence of any osseosis involvement in other regions. [8] Furthermore, bone marrow aspiration biopsy is required to eliminate the systemic forms of the disease (to investigate the bone marrow involvement), as well as abdominal ultrasonography (to investigate the hepatic or splenic involvement). [8] The treatment of solitary vertebral lesions is symptomatic, spinal ortesis is rarely required. It is observed that in time the height of the vertebral corpus is reachieved by time in most lesions. [1] Surgical intervention is unnecessary, and it may prevent the natural improvement in the course of the disease by damaging the endplates.

Aneurysmal bone cyst is mostly seen in the posterior components of the vertebrae. [7] Low back pain may develop after the pathological fracture as well as the lesion itself. Radiographies and BT analysis indicate an expansile lesion, which results in a thin cortex (Figure 4a). Visualising the liquid-liquid levels by magnetic resonance imaging is supportive in the diagnosis, particularly in children (Figure 4b). Intralesional excision-curettage (especially by using a high speed burr) and grafting are indicated; however it should be kept in mind that they have high recurrence rates (up to 25%). [7] For treatment purposes or bleeding control, embolisation can be considered preoperatively. [7]

In our study, all spinal neoplasias were treated using several surgical interventions except one patient with eosinophilic granuloma. Although until recent times biopsy had been recommended to confirm the diagnosis, nowadays it is commonly accepted that the lesion should be clinically and radiographically followed up in solitary vertebral lesions due to eosinophilic granuloma. We performed biopsy on one of our initial cases while we treated the other one conservatively. Both patients still have an ongoing radiological improvement in addition to the clinical improvement they had. In our study, the cases with osteoid osteoma and aneurysmal bone cyst underwent surgical treatment. They achieved full clinical improvement, and no recurrence was observed during the follow-up.

The spinal infections (diskitis and vertebral osteomyelitis) usually present with severe low back pain, abnormal gait and systemic findings (fever, vomitting, nausea) in children less than 10 years old. Lumbar vertebral involvement is more common (spaces L3-L4 or L4-L5 in 80% of the cases), and the pain usually radiates to the hips and lower extremities. [1,3,9] Physical examination

reveals rigid vertebrae and sensitivity in the involved area. The patients have a typical waddling gait. Neurological involvement is rare, and its presence should alert for development of epidural abcess. Before it had been considered that the diskitis was a bacterial or viral infection limited to the disk region, however the developments in the imaging studies (specifically MRI) have shown that it begins as an osteomyelitis in the vertebra corpus, and then spreads into the disk space.

The erythrocyte sedimentation rate (ESR) and C-reactive protein (CRP) levels are high in spinal infections; and they are helpful in monitoring the course of the disease and the response to the treatment. [1,3,9] In patients with suspected spinal infections, the underlying microorganism can be isolated in the blood culture. S. aurelus is the most commonly isolated microorganism, [1,3,9] where the methicilline-resistant ones usually lead to nosocomial, and methicilline-sensitive ones to community acquired infections. Early plain radiographies are normal since it takes 2 to 4 weeks for the disc space to contract and the bone reaction to become evident. Early sintigraphy and MRI are supportive in the diagnosis. Magnetic resonance imaging is also useful to distinguish diskitis and osteomyelitis from epidural abcess. It has been indicated that needle aspiration biopsy under computed tomography is effective in obtaining positive cultures. [9]

In addition to the rest and immobilization, antibiotics are immediately started in such patients without performing a biopsy. Biopsy is usually considered as the last choice for non-responding patients. Parenteral antibotics treatment addressing the S. Aeurus (parenteral naphcilline or cephasoline) is usually responded faster.[9] The effectiveness of the treatment can be followed-up by ESR and CRP; CRP returns to normal faster. Presence of epidural abcess accompanied by neurological findings present an indication of the need for open drainage.[1,3,9] Although the disc distance is reconstructed in various grades after the diskitis, it never becomes completely normal. In our study, two patients who were treated by antibiotics due to the diagnosis of diskitis showed rapid improvement in their clinical findings and laboratory values.

Although Pott abcess activated by M. tuberculosis is very rare in children, it is still a major issue in our country. The manifestation of vertebral osteomyelitis developing depending on other factors is also common in such children. Collapse in the vertebral corpus (see-mail 8) involved and its relative deformity (kyphosis) are important findings in the radiographies. MRI is the most beneficial method in determining the disease's radiation (both into the paraspinal region and medullar canal). The reproduction of the active microorganism in the tissue culture, which was taken during the operation and pathological analysis are valuable in confirming the diagnosis. In our study, two patients with confirmed Pott abcess underwent drainage and strut grafting through anterior intervention, and subsequently pelvipedal cast treatment. Then they received long-term antituberculosis treatment protocol.

The incidence of disk hernia is between 1 to 4 % in children whereas it is frequent in adults. [10,13] Herniations usually occur at levels L4-5 or L5-S1, and they usually cause pain radiation and secondary vertebral deformities (scoliosis). Neurological findings are uncommon. During the straight leg test, the pain can radiate into the heel. [10,13] Graphies are rarely useful, only 20% of the patients have narrowing in the disc space. The lesion must be visualized by MRI, and it should be kept in mind that the magnitude of herniation is not correlated with the prognosis. [10,13]

The initial treatment of disc hernia in children should include restriction of the activities and use of analgesics (or NSAIDs); surgical treatment is considered for patients who are not responding to a 4 to 6 weeks conservative therapy. The standard surgical treatment includes limited posterior laminectomy and excision of the disc fragments. [10,13] If the disc is extruded inside the fragment canal or if there is neurological symptoms, they have to be removed by surgery. In our study, most of the children with disc hernia showed improvement using conservative treatment while one patient underwent surgical treatment due to chronic complaints.

Other uncommon causes of low back pain in children include malign vertabral tumors (leukemia, Ewing sarcoma, metastasis), spinal cord tumors (astrocytoma, ependidome), apophys-

ical ring fractures, disc calcification and non-organic issues (juvenile fibromyalgia, overuse syndromes). Psychological problems should also be taken into consideration. Conversion reactions are very rare. When it is considered that there are psychological factors underlying the low back pain, the patient should be guided for psychiatric evaluations.

Low back pain is common in children and adolescents, and its incidence increases according to age. [14] Any low back pain persisting more than one week should be seriously evaluated, particulary in case of concomitant systemic symptoms. [14] Following a history and physical examination, radiological analyses are required as well as appropriate laboratory tests. In cases of absence of any positive findings, the patient can be symptomatically treated. However, if there is any evidence of an underlying pathology, the treatment should be planned according to the related pathology, and if required, the patients should be referred for surgery.

References

1. Ecker ML. Back pain. In: Drummond DS, editor. Spine: State of the art reviews. Strategies in the pediatric spine. Vol. 14, Philadelphia: Hanley & Belfus; 2000. p. 233-48.
2. Ikata T, Morita T, Katoh S, Tachibana K, Maoka H. Lesions of the lumbar posterior end plate in children and adolescents. An MRI study. J Bone Joint Surg [Br] 1995;77:951-5.
3. Taimela S, Kujala UM, Salminen JJ, Viljanen T. The prevalence of low back pain among children and adolescents. A nationwide, cohort-based questionnaire survey in Finland. Spine 1997;22:1132-6.
4. Seitsalo S, Osterman K, Hyvarinen H, Tallroth K, Schlenzka D, Poussa M. Progression of spondylolisthesis in children and adolescents. A long-term follow-up of 272 patients. Spine 1991;16:417-21.
5. Morita T, Ikata T, Katoh S, Miyake R. Lumbar spondylolysis in children and adolescents. J Bone Joint Surg [Br] 1995; 77:620-5.
6. Greene TL, Hensinger RN, Hunter LY. Back pain and vertebral changes simulating Scheuermann's disease. J Pediatr Orthop 1985;5:1-7.
7. Hay MC, Paterson D, Taylor TK. Aneurysmal bone cysts of the spine. J Bone Joint Surg [Br] 1978;60:406-11.
8. Yeom JS, Lee CK, Shin HY, Lee CS, Han CS, Chang H. Langerhans' cell histiocytosis of the spine. Analysis of twenty-three cases. Spine 1999;24:1740-9.
9. Ring D, Johnston CE 2nd, Wenger DR. Pyogenic infectious spondylitis in children: the convergence of discitis and vertebral osteomyelitis. J Pediatr Orthop 1995;15: 652-60.
10. DeLuca PF, Mason DE, Weiand R, Howard R, Bassett GS. Excision of herniated nucleus pulposus in children and adolescents. J Pediatr Orthop 1994;14:318-22.
11. Papagelopoulos PJ, Shaughnessy WJ, Ebersold MJ, Bianco AJ Jr, Quast LM. Long-term outcome of lumbar discectomy in children and adolescents sixteen years of age or younger. J Bone Joint Surg [Am] 1998;80:689-98.
12. McCall IW, Park WM, O'Brien JP, Seal V. Acute traumatic intraosseous disc herniation. Spine 1985;10:134-7.
13. Bradbury N, Wilson LF, Mulholland RC. Adolescent disc protrusions. A long-term follow-up of surgery compared to chymopapain. Spine 1996;21:372-7.
14. Burton AK, Clarke RD, McClune TD, Tillotson KM. The natural history of low back pain in adolescents. Spine 1996; 21:2323-8.