COMBINED ANTERIOR AND POSTERIOR FUSIONS IN SPINAL SURGERY

Mahir GÜLŞEN MD.* Emre TOĞRUL MD.* Mustafa HERDEM MD.*
Yaman SARPEL MD.* Serdar ÖZBARLAS MD.*

ABSTRACT:

Between January 1989-May 1995 fifty-six patients underwent combined spinal fusion in the Department of Orthopaedics and Traumatology of Çukurova University, Faculty of Medicine. The cases were 28 (50%) males and 28 (50%) females with a mean age of 21.62 (range 3-65). The indications for combined fusion in our patients were as follows; paralytic scoliosis in 11 (19.6%) cases, Pott's disease in 9 (16%), congenital kyphosis in 7 (12.5%), fractures in 6 (10.7%), idiopathic scoliosis in 4 (7.1%), degenerative instability in 3 (5.4%), Ankylosing spondilitis in 3 (5.4%), tumors in 2 (3.6%), neurofibromatosis in 2 (3.6%), Scheuermann's disease in 1 (1.8%), and adolescent scoliosis in 1 (1.8%). Anterior and posterior fusion of 7 cases were performed in the same session. Anterior fusion was performed prior to posterior in all patients except two cases who were supplemented by anterior fusion after insufficient posterior instrumentation. Anterior approach was performed as anterior cervical in 3, thoracotomy in 25, thoracoabdominal in 21, lumbar retroperitoneal in 7 patients.

In this report, our experience in combined spinal fusion, the discussion of indications and complications of the procedure will be presented.

Key Words: *Combined fusions, anterior fusion, posterior fusion.*

INTRODUCTION

Until the widespread use of anterior fusion in spinal surgery after Hodgson and Stock, posterior fusion was performed in priority (10).

As well as the solely performance of both procedures, combined technique may be indicative in same cases. The indications of combined fusion are advanced and rigid scoliosis, congenital spinal deformities, complex tumors of the spine, spinal fractures or fracture - dislocations, Pott's disease, degenerative instabilities and advanced spondylolisthesis (1, 7, 10, 14, 21).

PATIENTS AND METHOD

From January - 1989 to May - 1995 fifty-six (56) combined anterior and posterior spinal fusions were performed in our department. The cases were 28(50%) males and 28 (50%) females with a mean age of 21.62 (3–65). The details and features of these cases are shown in Table -I. First anterior spinal fusion was performed in all patients. Surgical approach was done from the convex side in patients with scoliosis and from the left in all other cases. The anterior approach and posterior instrumentation types are shown in Table II and III.

Table 1. The Features of the Cases

ETIOLOGY	NUMBER
Pott's Disease	9 (16%)
Congenital kyphosis	7 (12.5%)
Adolescent scoliosis	1 (1.8%)
Paralytic scoliosis (Poliomyelitis)	11 (19.6%)
Idiopathic scoliosis	4 (7.1%)
Congenital scoliosis	7 (12.5%)
Neurofibromatosis	2 (3.6%)
Degenerative instability	3 (5.4%)
Fracture	6 (10.7%)
Tumor	2 (3.6%)
Ankylosing spondylitis	3 (5.4%)
Scheuermann's disease	1 (1.8%)

Table 2. Approach Types

ANTERIOR APPROACH	LEFT	RIGHT	TOTAL
Anterior Cervical	3		3
Thoracotomy	21	4	25
Thoracoabdominal	14	7	21
Lumbar Retroperitoneal	7		7

* Çukurova University Faculty of Medicine, Department of Orthopaedics and Traumatology Adana/TÜRKİYE

Table 3. Instrumentation Types

POSTERIOR INSTRUMENTATION	NUMBER
Hartshill System	13
Luque System	10
Isola System	18
CD Instrumentation	7
Plate + Screw Fixation	70
Only Bony Fusion	5

Anterior and posterior fusion of 7 cases were performed in the same session. These were 2 cases of congenital scoliosis, one degenerative instability, four spinal fracture-dislocations. In 2 cases anterior fusion was done after the posterior one.

Posterior fusion was performed mean after 16.3 days (range 7, 27) in all other cases. Halo-femoral traction was applied after the anterior fusion in cases with advanced and rigid deformities. The cases whom we treated without posterior instrumentation were immobilized in a cast for 2-4 months.

FINDINGS

The mean operation time for anterior fusion was 200 minutes, posterior fusion 205 minutes and combined fusion in the same session 245 minutes. The average blood loss in anterior and posterior fusions were 565 cc and 585 cc respectively. The average time of thorax tube removal was 4.7 days. Intra and early postoperative complications are shown in Table IV. Case examples are shown in Figure 1-4.

Table 4. Complications

INTRAOPERATIVE COMPLICATIONS	NUMBER
Iliac Vein Laceration	1
Pulmonary Laceration	1
Pleural Laceration	1
Early Extubation + Cardiac Arrest	1
Paraplegia	1
POSTOPERATIVE COMPLICATIONS	
Atelectasis	2
Urinary Tract Infection	2
Superficial Infection	5
Deep Infection	1
Pressure Ulcer	1
Retrograde Ejaculation	1
Exitus	1
Pseudoarthrosis	1
Implant Failure	2
Graft Dislocation	1
Urinary Incontinance	1

In one case extubation and cardiac arrest was occurred while the wake-up test, the patient was resuscitated and the operation finished. No postoperative pathology occurred in this patient. Iliac vein of a case was lacerated while a lumbosacral fusion. This operation was also continued after the vessel repair. Pleural and pulmonary lacerations were repaired in the operation and these patients have had no problems. While the wake-up test; we determined motor palsy in a case with advanced thoracal kyphosis and mild chord pressure due to Pott's disease. The Luque instrumentation which we performed after the anterior fusion in the latter case was removed. The neurologic status of this patient did not change until the day of discharge.

Complications like atelectasis, urinary infection, superficial infection were cured by medical treatment. Pressure ulcers over the gibbosities were managed with flap rotations. The infection in a case of paralytic scoliosis was cured by the removal of the Hartshill instrumentation in the postoperative 6th. month. We have observed retrograde ejaculation in a case with postdiscectomy syndrome and degenerative instability in a case with lumbosacral fusion. One patient with cervical kyphosis died as a result of cerebrospinal fistula. Urinary incontinence in one, pseudoarthrosis in one, implant failure in two and graft dislocation in one patient were the other serious complications.

DISCUSSION

Solely performance of anterior or posterior fusion in complex spinal deformities may be an insufficient surgical treatment. Combined fusion increases the success rate in such cases (9).

It has been shown that the kyphosis would increase in Pott's disease involving two or more levels even after anterior fusion (6). If there are more than two levels of involvement, excessive destruction and advancement in kyphosis after anterior fusion or if early mobilization is required; the indication of combined fusion is absolute (6, 19). Only posterior fusion is not sufficient in cases of kyphosis who requires surgical treatment. Combined fusion and instrumentation are providing adequate correction, protection of correction and early mobilization (7, 12, 16).

The best results in cases with neuromuscular scoliosis especially the ones with pelvic tilt and wide C curves, could be obtained by combined fusion (4, 7, 22) Crankshaft phenomenon in cases of scoliosis below 10 years of age who need fusion is preventable by

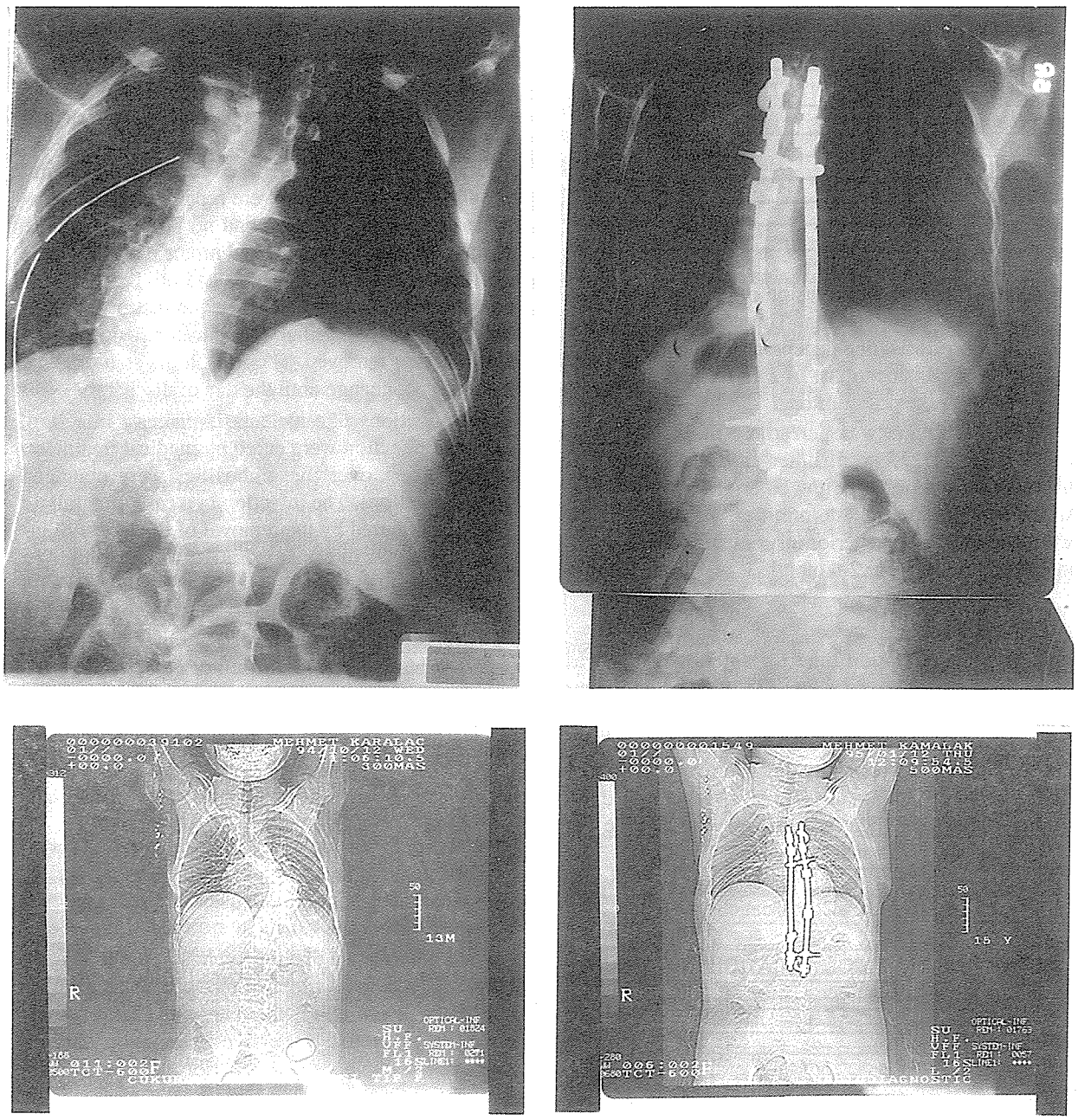
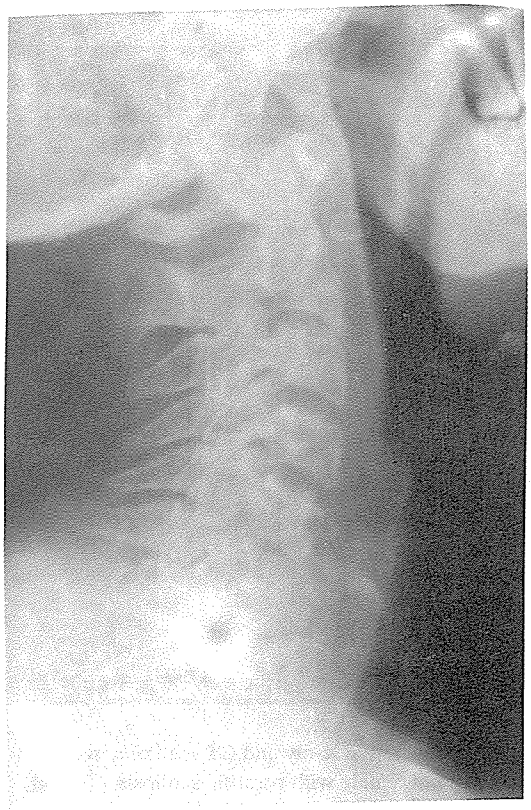


Figure 1. Preoperative and postoperative CT scans of a fifteen-years-old male with congenital scoliosis. The left thorasic scoliosis angle decreased from 50° down to 20° with combined fusion and CD instrumentation.

combined technique (2, 24, 26). The deformities of the cases with congenital spinal anomalies could be controlled and corrected by anterior and posterior convex hemifusion (7, 11, 13, 16, 26).

Due to Bridwell (2) combined fusion is indicated in patients with curves more than 80° and cannot decrease below 50° by leaning. Dickson (7) recommended the combined fusion for patients with curves more than 65°, excessive lordosis, and double major curves (2, 7, 15, 23, 24). Combined fusion indication is disputable in patient with dystrophic spinal deformities due to neurofibromatosis (3, 7). Better results could be



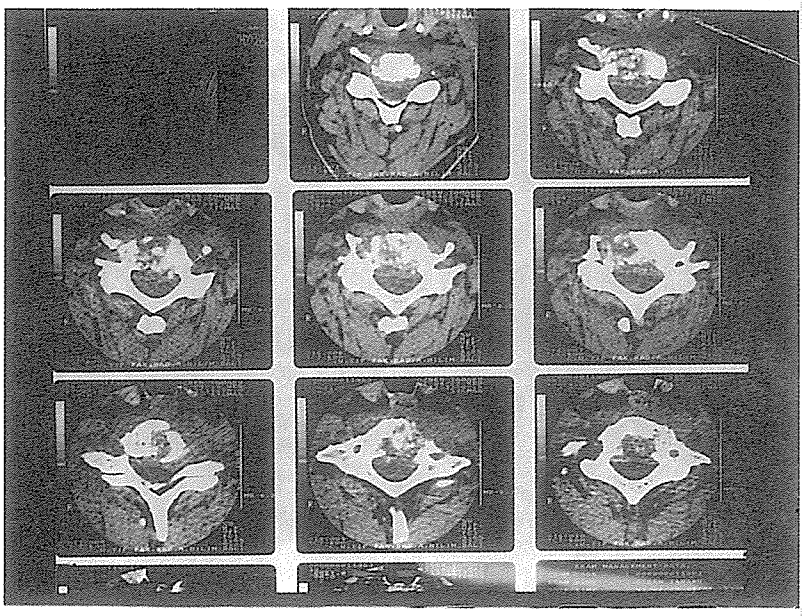
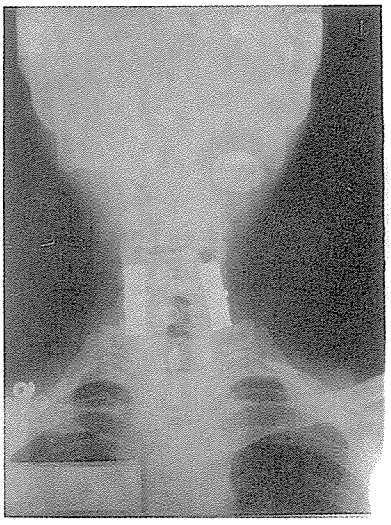


Figure 2-A. Preoperative X-rays and CT scan of a twenty two years old female with cervical Pott's disease.

Figure 2-A. Preoperative X-rays and CT scan of a twenty two years old female with cervical Pott's disease.



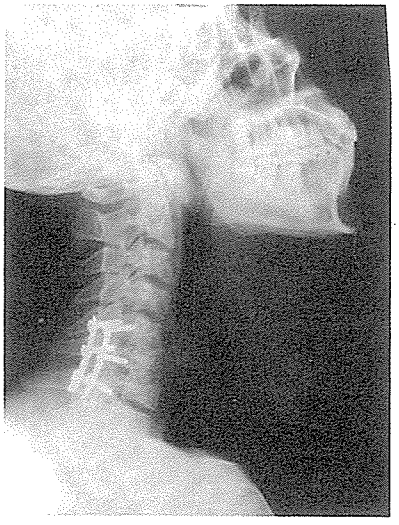


Figure 2-B. Early postoperative anteroposterior and lateral X-rays of the case in Fig-2 after combined fusion and double plate-screw fixation.

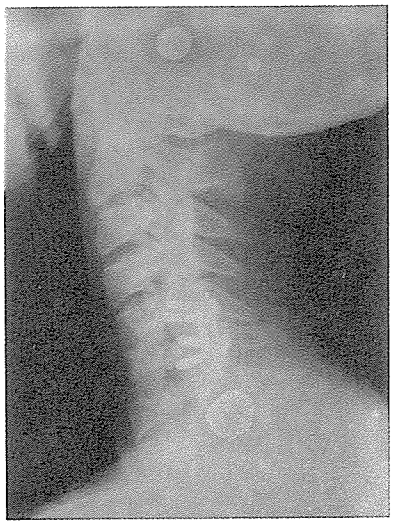


Figure 2-C. Lateral X-ray one year after the operation showing complete lower cervical fusion.

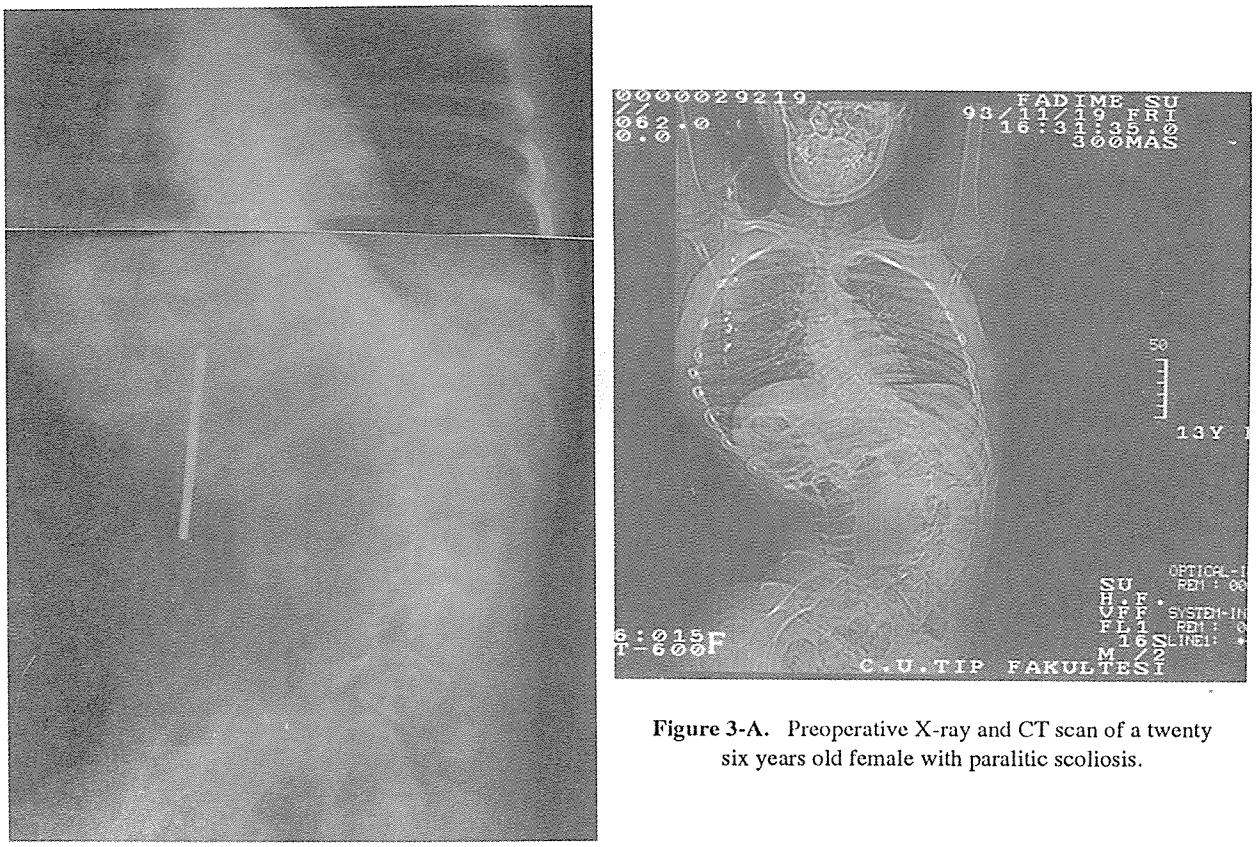


Figure 3-A. Preoperative X-ray and CT scan of a twenty six years old female with paralitic scoliosis.

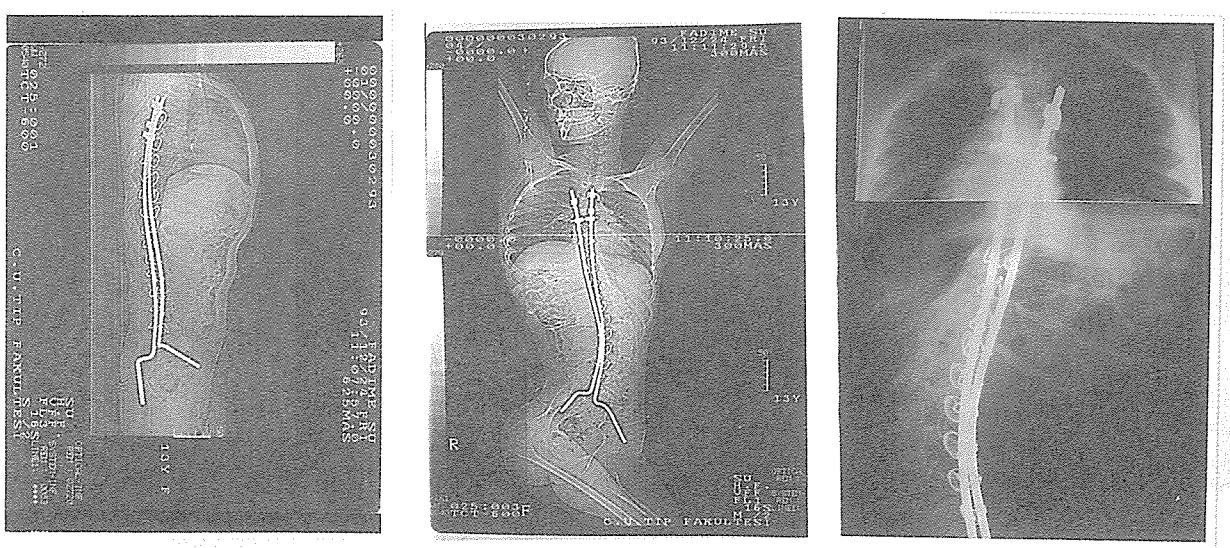
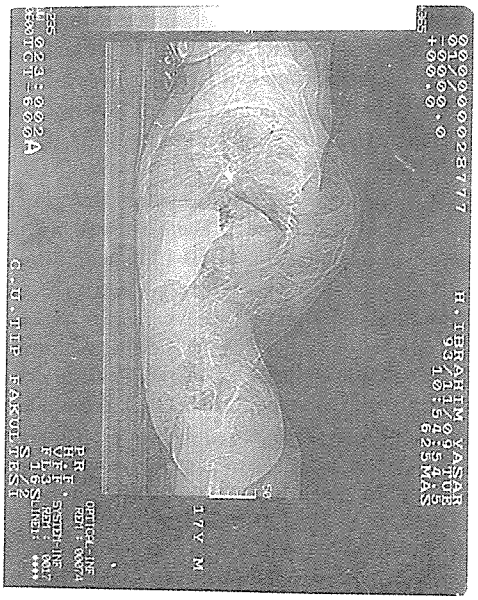
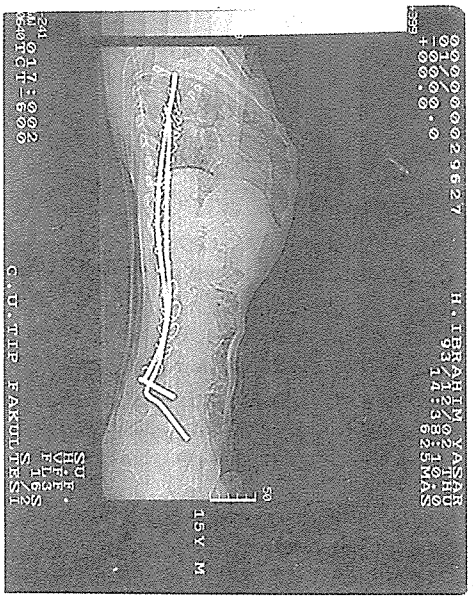
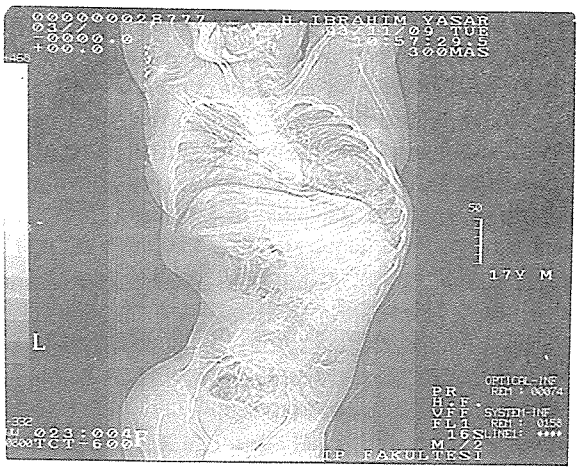


Figure 3-B. Complete thoracolumbar combined fusion by Luque-Galvestone technique.







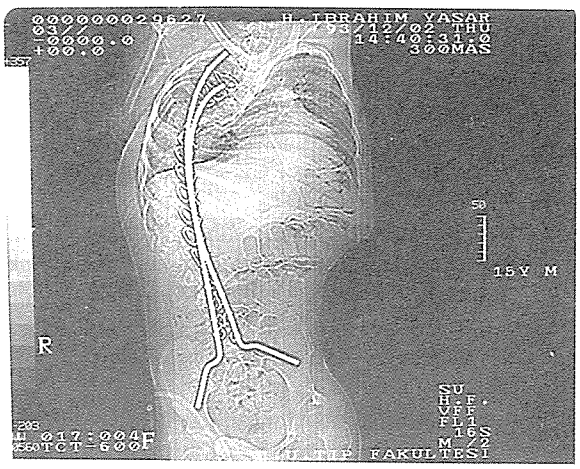


Figure 4-A. Preoperative lateral and anteroposterior CT Scans of a 17 years old male with paralytic scoliosis.

Figure 4-B: Lateral and anteroposterior CT Scans of the same patient after combined fusion by Luque-Galvestone technique.

obtained by combined technique in degenerative spinal deformities requiring more than two levels of fusion or having an unsuccessful prior operation (5, 21).

Combined fusion is recommended in burst fractures with sagittal index over 25° and cervical fractures that are involving 3 colons and impossible to perform a rigid fixation (8, 17, 18, 25). Tumors requiring total vertebrectomy or creating excessive instability are also indications for combined fusion (20).

Anterior and posterior fusion could be performed

in the same or different sessions. If the condition of the patient is available, same session performance should be preferred. As it seems a heavy procedure, combined fusion could improve the success of surgery with appropriate indication and patient selection.

REFERENCES

1. Alıcı E: Omurga Hastalıkları ve Deformiteleri. İzmir, T.C. Dokuz Eylül Üniversitesi Yayınları, 1991.
2. Bridwell KH: Idiopathic scoliosis. Bridwell KH, DeWald RL (eds): The Textbook of Spinal Surgery, Philadelphia, vol. 1, JB Lippincott, 1991, pp. 97-162.
3. Brown CW: Spinal deformities in neurofibromatosis. Bridwell KH, DeWald RL (eds): The Textbook of Spinal Surgery, vol. 1, Philadelphia, JB Lippincott, 1991, pp: 445-458.
4. Camp JF, Wenger D, Mubarak S: Neuromuscular scoliosis. Rothman RH, Simeone FA (eds): The Spine, vol 1, Philadelphia, W.B. Saunders, 1992, ed. 3, pp: 431-484.
5. Colemont J, Zielke K: Surgical treatment of failed back syndrome. Bridwell KH, DeWald RL (eds): The Textbook of Spinal Surgery, vol 2, Philadelphia, JB Lippincott, 1991, pp: 739-748.
6. Currier BL, Eismont FJ: Infections of the spine. Rothman RH, Simeone FA (eds): The Spine, vol 2, Philadelphia, W.B. Saunders, 1992, ed 3, pp: 1319-1380.
7. Dickson RA, Leatherman KD: Spinal deformities. Dickson RA (ed): Spinal Surgery, Science and Practice. London, Butterworths, 1990, pp: 368-435.
8. Dickson RA: Thoracolumbar injuries. Dickson RA (ed): Spinal Surgery, Science and Practice. London, Butterworths, 1990, pp: 307-323.
9. Ege R: Torakal ve toracolumbar vertebra tesbit ve füzyonları. Ege R (editör): Vertebra, Omurga, Ankara, Türk Hava Kurumu Basımevi, 1992, sayfa 257-285.
10. Ege R: Tıp tarihinde vertebranın yeri. Ege R (ed): Vertebra, Omurga, Ankara, Türk Hava Kurumu Basımevi, 1992, sayfa: 1-13.
11. Gülşen M: Konjenital lordoz. Ege R (editör): Vertebra, Omurga, Ankara, Türk Hava Kurumu Basımevi, 1992, sayfa 433-435.
12. Hammerberg KW: Kyphosis. Bridwell KH, DeWald RL (eds): The Textbook of Spinal Surgery, vol 1, Philadelphia, JB Lippincott, 1991, pp: 501-524.
13. Hamzaoğlu A, Çetinaydınok H, Kokino M, Akman Ş: Omurganın Konjenital anomalileri ve cerrahi tedavisi. 12. Milli Türk Ortopedi ve Travmatoloji Kongre Kitabı, Ankara, Türk Hava Kurumu Basımevi, 1991, sayfa 579-582.
14. Hız M: Vertebrada diğer cerrahi girişimler ve ameliyat sonrası bakım. Ege R (editör): Vertebra, Omurga, Ankara, Türk Hava Kurumu Basımevi, 1992, sayfa 401-410.
15. Johnson RJ, Holt RT: Combined use of anterior and posterior surgery for adult scoliosis. Orthop Clin N Am 19: 361-370, 1988.
16. Lubicky JP, Shook JE: Congenital spinal deformity. Bridwell KH, DeWald RL (eds): The Textbook of Spinal Surgery, vol 1, Philadelphia, JB Lippincott, 1991, pp: 365-396.
17. McAfee PC Bohlman HH: One-stage anterior cervical decompression and posterior stabilization with circumferential arthrodesis. A study of twenty-four patients who had a traumatic or a neoplastic lesion. J Bone and Joint Surg 71A: 78-88, 1989.
18. Meyer PR: Cervical spine fractures: Changing management concepts. Bridwell KH, DeWald RL (eds): The Textbook of Spinal Surgery, vol 2, Philadelphia, JB Lippincott, 1991, pp: 1001-1080.
19. Moon MS: Combined posterior instrumentation and anterior interbody fusion for active tuberculosis kyphosis of the thoracolumbar spine. Current Orthopaedics 5: 177-179, 1991.
20. Roy-Camille R, McCullough CJ: Extradural tumors. Dickson RA (ed): Spinal Surgery, Science and Practice. London, Butterworths, 1990, pp: 523-540.
21. Selby DK, Henderson RJ: Circumferential (360 degree) spinal fusion. Frymoyer JW (ed): The Adult Spine, Principles and Practice, vol 2, New York, Raven Press, 1991, pp: 1989-2006.
22. Shook JE, Lubicky JP: Paralytic spinal deformity. Bridwell KH, DeWald RL (eds): The Textbook of Spinal Surgery, vol 1, Philadelphia, JB Lippincott, 1991, pp: 279-322.
23. Surat A, Yazıcı M, Acaroğlu E: Yüksek açılı ve rijit skolyotik eğriliklerde iki aşamalı girişimlerin erken dönem sonuçları. 12. Milli Türk Ortopedi ve Travmatoloji Kongre Kitabı, Ankara, Türk Hava Kurumu Basımevi, 1991, sayfa 564-568.
24. Tümer Y: Skolyoza genel bakış. Ege R (editör): Vertebra, Omurga, Ankara, Türk Hava Kurumu Basımevi, 1992, sayfa 499-512.
25. Weidenbaum M, Farcy JC: Surgical management of thoracic and lumbar burs fractures. Bridwell KH, DeWald RL (eds): The Textbook of Spinal Surgery, vol 2, Philadelphia, JB Lippincott, 1991, pp: 911-957.
26. Winter RB, Lonstein JE: Juvenile and adolescent scoliosis. Rothman RH, Simeone FA (eds): The Spine, Philadelphia, W.B. Saunders, 1992, ed 3, pp: 373-430.