Spinal disorders

Overall impact on society and the need for orthopedic resources

Alf L. Nachemson

An overview is presented on spinal disorders in the community based on Swedish statistics gathered over the last 15 years and projected for the year 2000. Commonly encountered spinal problems are discussed, and their need for both nonsurgical and surgical treatment by the year 2000 is calculated.

Department of Orthopedics, Sahlgren Hospital, S-413 45 Gothenburg, Sweden
Tel + 46 - 31 60 18 15. Fax + 46 - 31 60 26 30

This overview is based on actual Swedish statistics gathered over the last 15 years and projected for the year 2000. Only the more commonly occurring spinal disorders are discussed. Most spinal disorders are treated by orthopedists, some also by rheumatologists and neurosurgeons. The contribution from these last-mentioned specialists is, however, fairly small, except for disc surgery, where the overall Swedish figures include those 10 percent performed by neurosurgeons.

For all the estimations made in this text, the numbers given for the need for nonsurgical and surgical treatment, respectively, for the various disorders are calculated as number of cases per million inhabitants per year. In the mid 1980s, Sweden had 8.5 million inhabitants. Corrections have been made for demographic changes that have occurred since 1970 and that are known to be occurring until the year 2000.

I have also tried to incorporate into the projections new knowledge of natural history and better diagnostic and therapeutic methods that will alter current indications.

Scoliosis

The last 15 years have established the use of spinal fusion with Harrington rods for idiopathic scoliosis, and the relative effectiveness of braces for preventing progression (Cochran et al. 1983, Cochran and Nachemson 1985). The rate of failure of bracing amounts to 20–40 percent of all the cases depending on the age of the patient and the type of curve.

Also the relative, but not absolute, value of school screening has been demonstrated (Torell et al. 1981, Willner 1985), as well as very limited indications for fusion of the lumbar scoliotic spine (Afonja et al. 1988). As early as the mid 1970s, based on the 10 years' experience in Gothenburg, I calculated the society's need for treatment in this disease (Nachemson 1976). The Swedish National Board of Health and Welfare, together with the Swedish Orthopedic Society, decided to establish five centers to treat scoliosis, which in essence has been adhered to over the last 15 years. The calculations based on my experience from Gothenburg was that approximately 2–3 in 1,000 children born will need bracing, whereas surgery would be needed in 0.5–1 children.

Repeat calculations performed by Willner in Malmö (1985) confirm these figures, and rechecking our own data base (Torell et al. 1981, Ryan and Nachemson 1987) also confirms that the incidence of adolescent idiopathic scoliosis of 25° or more is not decreasing in Sweden. The backlog of patients in need of treatment that we encountered in the 1970s has now been taken care of. Surgical treatment of still existing adult cases has only a relative indication (Sponseller et al. 1987). Thus, projections for the year 2000 can be made with some degree of certainty (Table 1): the need for treatment of scoliosis and congenital kyphosis will increase by one third. This is based on an increased number of children being born in the mid 1980s and the likelihood of a slight augmentation or failed brace patients due to noncompliance, which seems to be a trend. Considerations are also given to improved surgical techniques, enabling us to perform an increased number of operations on young patients with severe neuromuscular diseases.

Spinal cord injuries

The Swedish summers are generally cool, which usually does not invite too much swimming and diving. Also for 10 years, we have had a seat-belt law. Such facts influence the number of unstable spinal fractures with or without spinal-cord injuries that will occur. In Gothenburg, we have a spinal injury center serving approximately 2.5 million people, and based on the figures calculated from its patient population, we receive a fairly good picture of spinal cord injury incidence (Table 2).

Table 1. The need for treatment of scoliosis and congenital kyphosis per million inhabitants per year

	Nonsurgical treatment	Surgical treatment
1970	100	300
1985	160	50
2000	150	60

Table 2. Spinal cord injuries—incidence per year per million inhabitants (Kelsey et al. 1978, Sullivan 1988)

Australia	30
Canada	15
USA	50
Sweden	10

Table 3. The need for treatment of unstable spinal fractures per million inhabitants per year

	Nonsurgical treatment	Surgical treatment
1970	30	5
1985	20	20
2000	10	30

Table 4. The need for treatment of spondylolisthesis per million inhabitants per year

	Nonsurgical treatment	Surgical treatment
1970	100	5
1985	100	15
2000	150	20

A slight increase in the need for surgical treatment of unstable spinal fractures with and without neurologic injuries can be anticipated at the turn of the century (Table 3).

Spondylolysis and spondylolisthesis

Several new studies (Fredrickson et al. 1984, Saraste 1987, Frennered 1988) have delineated the natural history of subjects who have a lysis (3 percent) and olisthesis (another 3 percent). In patients seen before 20 years of age, it has been demonstrated (Fredrickson et al. 1984, Saraste 1987) that the risk of progression overall in grades I to IV. Progression very rarely exceeds more than one additional Meyerding grade (25 percent). In adults (> 20 yrs old) progression never exceeds that amount. With the exception of L4–L5 spondylolisthesis, which has a more pessimistic prognosis with regard to progression as well as pain, the overall outlook for patients with a diagnosed spondylolisthesis is fairly good. In the 20 year follow-up of 250 patients by Saraste (1987), 50 percent claimed frequent occasions of sick leave due to back pain and 20 percent had frequent attacks of sciatica. This figure significantly exceeds those of the general population (Svensson 1981, Vallfors 1985). The number of permanently disabled patients with spondylolisthesis under the age of 50 years did not show a significant increase compared with the general population (Saraste 1987, Frennered 1991).

Indications for conservative and surgical treatment will probably not change; but with our new knowledge of the natural history, it is likely that more surgery will be performed, perhaps with the use of stabilizing instruments, such as interpedicular screws and plates. These may make it possible to obtain a higher rate of fusion also in older patients (> 40 yrs old; Uhthoff and Armstrong 1988). As seen in Table 4, the numbers for surgery are fairly small both now and in the future.

One additional reason for this is the fact that long-term studies have demonstrated symptoms and radiographic changes above the fused area in a fairly high percentage of cases some 10–30 years later (Frymoyer et al. 1979, Johnson and Kirwan 1983, Lehmann et al. 1987).

Spinal stenosis and instability

It is highly probable that it is in these areas the major increase in treatment needs will occur. This is due to the fact that the next 15 years will see the following:

a. An increased number of older patients.
b. The new fixation methods will improve both fusion rate and results in this group of patients, in which ordinary fusion techniques without internal fixation often leads to pseudarthrosis.
c. The older population will have an increased need to move around; henceforth, the symptoms of instability and stenosis will be accentuated. To combat osteoporosis, old-age fitness programs will be recommended (Granhed 1988), if not mandatory, while walking to stores becomes a necessity for survival. Personnel for home-assistance will be scarce.
d. We will be able to diagnose instability more clearly (Stokes and Frymoyer 1987) by the use of biplane stereographic films with the Selvik technique (Selvik 1974). The method is already in existence (Olsson et al. 1976, 1977).

Johnsson (1987) has demonstrated that fusion is needed even when we perform a fairly limited laminectomy for spinal stenosis including a partial

facetectomy. Improved diagnostic measures, such as somatosensory registrations (SEP), nerve conduction studies, and CT and MRI, will improve our abilities to diagnose also root-canal stenosis. Thus, by the year 2000, lumbar fusion in the older age group particularly will increase in Sweden, but certainly will not approach those figures seen today in the United States (Table 5; Volinn 1987, Volinn et al. 1988). As seen in Table 6, the need for spine surgery in the older age groups most likely will double, perhaps even triple, by the year 2000.

Table 5. Rate of spinal fusion per million inhabitants per year

		All types of fusion on the whole spine	Lumbar fusions
USA	1979	285	52
USA	1981	347	88
USA	1983	400	99
Sweden	1983	55	15

Table 6. The need for treatment of spinal stenosis and instability per million inhabitants per year

	Nonsurgical treatment	Surgical treatment
1970	?	10
1985	50	80
2000	100	150

Table 7. Absence from work due to back syndromes 1987

	No. insured	Days sick
Gothenburg	243,000	2,112,000
Sweden	4,600,000	28,400,000

Low back pain and sciatica

The epidemic increase of sickness in low back pain syndromes is actually threatening the social welfare system in societies with socialized medicine (Waddell and Main 1984, Nachemson 1985, Nachemson et al. 1987, Waddell 1987, Allan and Waddell 1989, Editorial 1989). It can be calculated that if the current trend of morbidity in low back pain in Sweden continues there will be little available resources for health care in general, because too many sick days and too much premature disability pension will drain the resources. It is hoped that this current increase can be decreased.

It is also quite clear that the back problem is not only medical, but also political. At the present time, it seems that in our modern societies even a little pain and discomfort is put on the agenda for abolishment. I (Nachemson 1991) recently concluded a study in Gothenburg on the average number of days subjects were not working because of back pain in 1987 (Table 7). The 213,000 people in Gothenburg that were listed as employees entitled to sick-insurance benefits were sick listed 6.6 million days in 1987. Twenty-seven percent of these days were due to back pain. By anatomic region, the low back averaged 34 days, totaling 800,000 days, neck-shoulder averaged 71 days (700.000 days), and neck plus low back averaged 115 days (300,000 days), i.e., 44, 38, and 17 percent in each of these categories (Table 8). Sweden's 4.6 million sick-insured in 1987 lost 41 million working days due to back pain (Table 7). The increase in sick listing due to low back pain since 1970 is seen in Table 8. These numbers are staggering; and they even become worse when we consider the increase in people permanently disabled due to back pain, an increase that has mainly taken place in the 1980s when a new workers' injury compensation law was legislated. The increase in Sweden from 1952, 850 cases, to 1987, 57.000 cases, amounts to 6,000 percent, and compares fairly well with the figures noted by Fordyce (1985) for the United States for the period 1956–1976: viz., 2,700 percent. The total cost for society exceeds SEK 100 billions.

Disc hernia

Hult (1954), Horal (1969), Spangfort (1972), Svensson (1981), Chöler et al. (1985), Vallfors (1985) have delineated the fairly few operations under this diagnosis that have been performed in Sweden. As early as 1975 and again in 1983, calculations have been made of the number of disc hernia operations (statistics from the Swedish National Board of Health and Welfare). Approximately 200 operations (1983: 200, 1986: 215) are made for this diagnosis per million inhabitants per year in Sweden as compared with 800 in some parts of the United States (Kane 1982) and 450 in other parts (Keller 1987).

With improved diagnostic means using CT and in particular MRI, we will probably see a slight increase in the number of patients needing such surgery in Sweden, increasing to 250 (Table 9). Included in this

Table 8. Sweden—low back pain sick listing. Calculations are based on statistics from Hult (1954), Horal (1969), Chöler et al. (1985), Nettelbladt (1985) and Nachemson (1991)

	Percent of working population reported	Mean days
1970	1	20
1975	3	22
1980	7	25
1987	8	34
2000[a]		
exponential increase	31	40[b]
linear increase +2% per 5 years	12	40[b]

[a]Supposing that about 4.7 million employed outside the home.
[b]About the same increase as 1975–1987.

Table 9. Disc hernia patients in need of treatment per million inhabitants per year

	Nonsurgical treatment	Surgical treatment
1970	200	120
1985	200	200
2000	200	250

Table 10. Overall need for nonoperative and operative treatment of spinal disorders—approximation

	Nonsurgical treatment	Surgical treatment
1985	500	300
2000	600	500

number are also those patients that might be suitable for either injection therapy with some new chemical substance or needle nucleotomy. Both of these last procedures will only be suitable for those still having a fairly hydrophilic nucleus that extends out into the disc hernia. With MRI, we will probably be able to diagnose those cases. According to available statistics (Spangfort 1972), they account for up to 20 percent of the cases that we now operate on, but not more.

Solution of the low back problem

Up to 1980, little was proven in the way of scientific studies with regard to treatment of low back pain and sciatica, and the reader is referred to the report published as a supplement to *Spine* 1987 by the Quebec group (Nachemson with Spitzer et al. 1987). We will also know much more in the next decade about the importance of psychologic factors influencing low back injury reporting, and we will be able to deal more effectively with these problems in a preventive fashion (Nachemson 1984, Fordyce 1985).

The knowledge of the dangers of load deprivation and the importance of moderate exercises will spread in our populations (Nachemson 1989). Rest and inactivity actually inhibit healing of all the structures in the low back that may have been injured at work or during leisure time. Randomized prospective studies on various treatment methods, including surgery, will provide further help in solving the problem from a medical perspective (Nachemson and LaRocca 1987). Politicians will be forced also to make changes to promote activity and health, rather than inactivity and increased sickness.

Conclusion

Orthopedic surgeons have for many years led the research around spinal disorders (Nachemson 1976). This also includes the common low back syndromes. By employing scientifically based treatment programs (Rudicel and Esdaile 1985, Nachemson with Spitzer et al. 1987), our societies will be able to partly solve this problem from a medical point of view; it is hoped that politicians will understand their important role over the next 10 years.

The overall need for specialized nonsurgical orthopedic treatment of spinal disorders will increase by 20 percent from 1985 until 2000 (Table 10). The demand for surgical treatment will probably increase by 65 percent.

The need for surgery by the year 2000 in developing countries will most likely be much higher when it comes to deformities, but less in the older age and for back pain. It is not likely that new diagnostic means will increase the number of orthopedic surgical procedures to a significant extent, nor can we foresee any major change in surgical technology in this area.

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