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Traumatic spinal cord injury as a complication to ankylosing spondylitis. An extended report

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ABSTRACT

Objective: *Käpylä Rehabilitation Centre is in Finland the only unit taking care of the subacute rehabilitation activities of patients with spinal cord injury (SCI). The annual incidence of new patients with SCI is 55 (1.1 per 100,000 inhabitants). The ankylosed spine (AS) is reported to be at greater risk for fracture and SCI. The aim of the study was to clarify if this higher risk of ankylosing spondylitis (AS) could also be detected among patients with traumatic SCI rehabilitated at Käpylä Rehabilitation Centre. Further, the aim was to evaluate the characteristics of patients with traumatic SCI as a complication to AS in order to develop prevention of SCI in patients with AS.*

Methods: *Patient data was gathered from the patient register covering all Finnish patients with traumatic SCI (n = 1,103) rehabilitated at Käpylä Rehabilitation Centre from the year 1979 to 1998. The patient journals were subjected to a detailed and systematic analysis. Data about patients with a history of AS (n = 19; 18 men, 1 woman) was then compared to the data about all the patients with SCI (n = 1,103; 902 men, 201 women).*

Results: *Based on the national prevalence data, the incidence rate of patients with AS for traumatic SCI was found to be 11.4 times greater than expected for the population at large. The mean age of the patients with AS was clearly higher (55.3 yrs) than the mean age of the whole group of patients (36.4 yrs) with traumatic SCI. The neurologic injury was at the cervical level in 84% of the patients with AS, but only in 48% of the patients with traumatic SCI in general. Among the patients with AS, the SCI was caused by slipping in 53% of the cases, whereas slipping was the reason for SCI only in 7% of the cases in general.*

Conclusion: *Patients with AS seem to run a higher risk of traumatic SCI than the people at large, and the injury levels are higher. In particular, male patients with advanced AS should be instructed to install preventive devices such as night lights and handrails, supports or head rests when driving a car, and they should avoid walking on slippery surfaces, loose carpets etc. They also should be encouraged to avoid excessive use of alcohol and activities involving the risk of physical injury such as contact sports.*

Introduction

The ankylosed spine is reported to be at greater risk for fracture and SCI (1-6). In ankylosing spondylitis (AS) this seems to be related to both: (1) lever arm effects associated with spinal rigidity and kyphotic deformities, and (2) impaired mechanical strength of the spine subjected to osteoporosis and destructive bony lesions.

AS is characterized by enthesopathy, which affects the anterior and posterior longitudinal ligaments, the *annulus fibrosus* of the intervertebral discs and joint capsules, and the ligaments of the apophyseal (facet) joints. Enthesopathic lesions tend to lead to ectopic membraneous bone formation. In advanced cases syndesmophytes, calcifications of the posterior columns of the spine, and finally the characteristic bamboo spine may develop. These changes predispose to secondary damage, because the most common mode of fracture - hyperextension injury - often extends through the intervertebral disc and involves the calcified anterior and posterior elements of the spine. Thus, the fractured AS spine lacks the usual stabilising ligamentous support.

In addition to the inherent susceptibility to and instability of their spinal fractures, there may be secondary damage caused by delayed diagnosis (7, 8). Patients have often been subjected to only minor trauma with back pain. They may be on analgetic and/or anti-inflammatory medication or be affected by their often debilitating disease and/or alcohol. All of these factors may divert the physician's attention from eventual serious and sometimes multiple and lethal spinal fractures (9-13). Furthermore, disease-associated radiological changes make the intepretation of routine x-rays difficult. Finally, patients with AS are subject to epidural hematomas caused by bleeding from the epidural venous plexus and/or diplöe of the pathologic bone more often than other subjects. It therefore seemed to us

Table I. Patient characteristics at the phase of traumatic spinal cord injury in ankylosing spondylitis (AS).

Accident year	Age (yrs.)	Duration of AS (yrs.)	Cause of accident	Neurologic injury level
1979	45 *	20	car (passenger)	C1-3, incomplete
1982	51 **	3	slipping	C6, complete
1982	72 **	30	fall (1/2 m)	C6, complete
1982	54	? ***	bicycle	C7, complete
1983	36	5	work accident, body contusion	C6, incomplete
1985	63	? ***	slipping	C5, incomplete
1986	58	24	slipping	C7, complete
1986	57	20	slipping	C6, incomplete
1988	69	? ***	slipping	C5, incomplete
1991	54	21	slipping	C6, incomplete
1991	57	17	slipping	T4, incomplete
1994	59	40	slipping	T4, incomplete
1995	60	30	slipping	T12, incomplete
1996	58	16	car (driver)	C7, incomplete
1997	52	37	car (driver)	C3, incomplete
1997	59 **	20-30	fall (1/2 m)	C5, incomplete
1997	42	13	car (driver)	C4, complete
1998	59	13	slipping	C4, complete
1998	46 **	13	fall (1/2 m)	C6, incomplete

* female; **alcohol use during the accident; ***no information available about the duration of AS, and no anti-rheumatic medicines used.

that the most significant long-term clinical complication of fracture, namely an associated spinal cord injury (SCI) in patients with AS, could be best studied in a national, population-wide spinal cord rehabilitation center.

The aim of the study was to clarify the risk of ankylosing spondylitis related to traumatic SCI in patients rehabilitated at Käpylä Rehabilitation Centre. A further goal was to evaluate the characteristics of patients with traumatic SCI as a complication of AS in order to develop preventive measures in AS patients.

Methods

Data was gathered from the patient register covering all patients with traumatic SCI rehabilitated during a 20-year period (1979-1998) at Käpylä Rehabilitation Centre. The Centre is the only special unit in Finland taking care of the subacute rehabilitation activities of the patients with SCI. The patient journals were subjected to detailed and systematic analysis. Data regarding patients with a history of AS (n = 19; 18 men, 1 woman) were then compared to the data for all patients with SCI (n = 1,103; 902 men, 201 women). The journals of the patients with AS were also subjected to detailed and systematic analysis and compared to the information available for all the patients in this database.

Results

Out of the all patients with SCI 1.7% (19/1,103) had a diagnosed AS. The age of the patients with traumatic SCI and AS (55.3 yrs) was clearly higher than that of the group of patients with traumatic SCI as a whole (36.4 yrs) (Table I). Most patients with AS had suffered from the disease for 10 years or more. Three patients had no information about having AS before their accident.

In 53% of the patients with AS traumatic SCI was caused by slipping, which was quite rare (7%) in the whole group of patients with traumatic SCI (Table II, chi-square: 56.03 with 1 d.f., p = 0.0005). In contrast, only 26% of the AS-associated SCI were acquired in traffic accidents, which was the most common cause (42%) for the SCI group as a whole. Three patients (16%) were injured by falls while inebriated. Other reasons underlay the SCI in 5% of the AS patients and in 21% of the SCI group as a whole. In Finland, one-

Table II. Causes of the traumatic spinal cord injury (SCI) among the patients with ankylosing spondylitis (AS) compared to the whole group of patients with traumatic SCI.

	AS		The whole group	
	N	%	N	%
Traffic accident	5	26%	461	42%
Slipping	10	53%	75	7%*
Fall	3	16%	338	30%
Other	1	5%	229	21%
	19	100%	1,103	100%

*Chi-square: 56.03 with 1 d.f., p= 0.0005.

third of the "other reasons"consisted of accidents linked to the popular custom of swimming after a sauna bath, in particular diving into a lake from a pier and encountering some rigid obstacle.

Patients with AS suffered from tetraplegia more often (84%) than patients with SCI in general (48%) (Table III, chi-square: 10.08 with 1 d.f., p = 0.002). The SCI usually occurred in or near the lower cervical spinal cord (C5-7) (Table I).

Discussion

The annual incidence of patients with AS and associated traumatic SCI in Finland was 0.95 (19 over a period of 20 yrs). The population of Finland is 5 million. The annual incidence of patients with traumatic SCI is 55, with the frequency being 1.1 per 100,000 inhabitants. The prevalence of patients with AS in Finland is 0.15% (n = 7,500) (14). The expected annual incidence of patients with traumatic SCI in the general population of 7,500 was 0.083. One can conclude that the inci-

Table III. Neurologic level of traumatic spinal cord injury among patients with ankylosing spondylitis (N=19) and the whole group of patients with traumatic spinal cord injury (N= 1 096; 7 missing data).

	Incomplete	Complete	All	
Ankylosing spondylitis				
Tetraplegic	10	6	16	84%*
Paraplegic	3	0	3	
All the patients with traumatic SCI				
Tetraplegic	324	197	531	48%*
Paraplegic	280	285	565	

* chi-square: 10.08 with 1 d.f., p=0.002.

dence of traumatic SCI among patients with AS is 11.4 (0.95/0.083) times higher than expected among the population at large. Ankylosing spondylitis seems very strongly to predispose to traumatic SCI.

The most severe cases do not reach the national spinal rehabilitation center due to early post-injury death (15). Because patients with AS paradoxically may often suffer from serious atlanto-axial subluxations (16), it can be anticipated that their cervical spine trauma-associated mortality as a result of high-level cervical SCI is increased compared to the general population, in whom the occipito-atlanto-axial junction is anatomically intact. In spite of this "drop-out", it seems that AS clearly is a predisposing factor for severe traumatic SCI. Interestingly, the male-to-female ratio in this nationwide series was 18:1,indicating that male gender is a further risk factor for these types of injuries, which is consistent with the report by Tico *et al*. (17). The sex ratio in AS may vary slightly depending on the patients studied, but is estimated to be 5:3 in Finland. However, men often have more severe disease than women. This, together with their higher tendency to engage in risk behaviour (for example, strenuous physical activity), may explain the skewed sex distribution of AS-associated traumatic SCIs.

The cervical spine is the most common site of spinal fracture in patients with ankylosing spondylitis, accounting for 75% of fractures in these patients (13, 18). This was also the case in our nationwide, population-based cohort consisting of SCI patients in need of rehabilitation. Furthermore, these cervical spine fractures usually occur at the lower cervical spine, which in routine x-rays is often difficult to interpret due to the overprojection of the shoulder girdle onto this anatomical area. A high level of suspicion and adequate radiological imaging are recommended in the clinical work-up of these patients. Patients with AS who present a history of even minor trauma should be managed as if they had a fracture until the diagnosis has been established or excluded. Magnetic resonance imaging has the potential to show intramedullary edema, cord compression, intraspinal hemorrhage and epidural hematoma (19). Therefore MRI is superior to other diagnostic techniques. Informing the medical colleagues who may initially evaluate these patients, such as rheumatologists, internists, emergency room physicians, and general practitioners, of the serious nature of these injuries may help to facilitate prompt and appropriate treatment (13).

The most obvious clinical implication from the clear-cut results of the present nationwide, epidemiological study is that patients with AS should be advised to engage in primary prevention. This is important because even minor injuries can lead to serious damage. AS patients may be affected with severe symptoms such as a high erythrocyte sedimentation rate, C-reactive protein values and general debilitation. This, together with the use of drugs which may affect the central nervous system (such as analgesics) may predispose these patients to minor trauma. This is particularly the case if the patients tend to abuse alcohol, which in combination with musculoskeletal impairment may subject these patients to uncontrolled slipping and falls (15). Even minor injuries can have serious consequences. Patients with clinically marked AS should be instructed to install preventive appliances such as handrails beside staircases and night-lights in bedrooms and bathrooms, and should avoid loose carpets on the floor (20, 21). When driving a car they should always use a seat belt, head rest and panorama mirror. They should avoid the excessive use of alcohol and engaging in risk behaviour such as contact sports and other violent activities. The price to be paid in quality of life and disability may otherwise be extremely high.

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