

An Analysis of the Diverse Factors Concerned with the Development of Pressure Sores in Spinal Cord Injured Patients

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Summary

Patients with spinal cord injuries (SCI) admitted to the Institut Guttmann, Barcelona, from the years 1985 to 1988 with pressure sores (PS) are reviewed.

Demographic, pathological and psychological factors are analysed in an attempt to identify organic and/or behavioural patterns which might imply an added risk for the development of pressure sores in the spinal cord injured.

About 30% of 884 SCI patients admitted during this period had one or more PS (mean 1.5), most of these were localised to the ischial, trochanteric and sacral regions, and about 70% were grade 3 or 4 (Enis and Sarmiento classification).

The study supports the generally acknowledged view that a precarious state of health and certain psycho-social conditions are contributing factors to a higher risk in the development and severity of PS in SCI patients.

Key words: Paraplegia; Pressure sores; Demographic factors; Psychological factors; Statistical analysis.

Pressure sores (PS) continue to be a serious and frequent complication in the life of a paraplegic, necessitating long stays in hospital in addition to high social cost. In spite of numerous studies and publications on this subject, it is still considered a pathology of second order, not receiving the attention that it merits in hospitals. In the specialised units for treatment of spinal cord injuries (SCI) one encounters a high incidence of this complication amongst patients transferred from other centres.

This paper is based on a retrospective study of those SCI patients admitted to Institut Guttmann of Barcelona during the period 1985 to 1988 who presented with pressure sores, with the intention of drawing up a profile of both the personality and the physical conditions of those patients admitted or readmitted for this reason.

Materials and methods

Out of the 884 SCI patients registered during these 4 years 268, that is 30·31%, had on admission to Institut Guttmann one or more PS as a related complication.

The data obtained from these patients was statistically analysed to see if there were any significant variables. The statistical method applied consisted of a first phase using CHI-2 and the t-Student tests. After that an analysis in depth with the help of statistical computer programmes, BMDP and MINITAB was carried out. A series of variables were analysed using a multiple linear regression method on the variable 'severity of pressure sore' with the aim of determining some significant relation which would help to define which patients would be more prone to develop a severe PS and under which circumstances.

The PS were classified according to their location and their severity using the Enis and Sarmiento 1 to 4 scale (Table I).

The following variables were analysed: 1. Distribution of pressure sores. 2. Location of severe pressure sores. 3. Study of demographic variables correlated with location and severity of pressure sores. 4. Analysis of associated pathologies. 5. Place patients came from.

Results

Of the 884 patients admitted during the last four years, approximately 30% (268 patients) had on admission one or more PS with an average of 1·5 PS per patient. Some patients were admitted specifically for treatment of PS while in other cases the presence of PS was not the primary cause for admission. Table II shows the variables analysed in this study.

Table I Enis and Sarmiento pressure sores classification system

1	Limited to the epidermis
2	Involving the epidermal and dermal layers
3	Extending through dermal layers and involving subcutaneous adipose tissue and muscle.
4	Destruction of all soft tissue structures to underlying bones or joints.

Table II Variables analysed

Age	Place patient comes from
Sex	Education
Neurologic level	Standing
Spasticity	Associated pathology: Mental,
Frankel grade	alcohol, drugs
	scoliosis, fractures, obesity,
	malnutrition, anemia, vascular
Aetiology	Para articular ossification
Recurrences	Contractures
Marital status	Renal function
Place of residence	Urinary infection
Economy	

The results related to the age of the population affected by PS show an increasing tendency in the number and seriousness of PS with age. This increased incidence is particularly marked in patients over 40 years of age (Fig 1).

Distribution by sex, followed the same pattern in the total population as in the sub population of 30% with PS. The ratio of 75% males to 25% females was maintained.

Comparing the distribution by diagnosis it was significantly shown ($p < 0.0002$) that patients with complete paraplegia had a higher incidence of pressure sores (Table III).

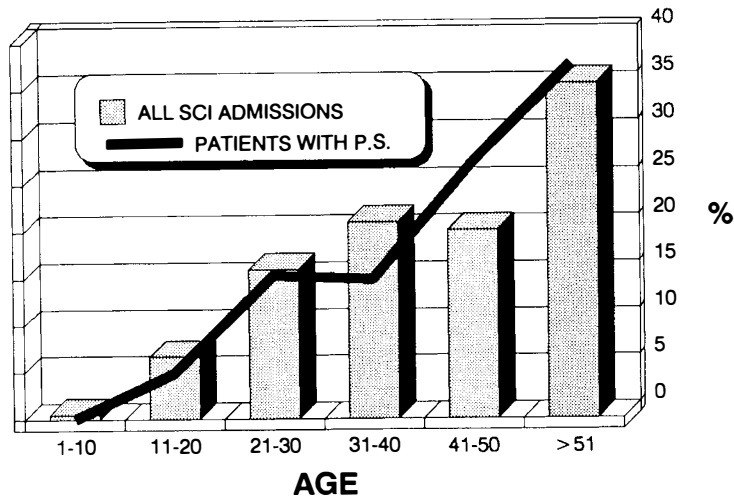


Figure 1 Distribution of pressure sores by age groups.

Table III Distribution by neurological level and extent of injury

Neurological level	Patients with pressure sores	All SCI admissions
Complete paraplegia	163 (60.82%)	398 (45.02%)
Incomplete paraplegia	17 (6.34%)	124 (14.03%)
Complete tetraplegia	40 (14.93%)	139 (15.72%)
Incomplete tetraplegia	22 (8.21%)	98 (11.09%)
Paraparesis	3 (1.12%)	40 (4.52%)
Tetraparesis	12 (4.48%)	50 (5.66%)
Cauda equina	11 (4.10%)	35 (3.96%)
Total	268 (100.00%)	884 (100.00%)

Table IV Distribution by Frankel grades

Frankel grades	Patients with pressure sores	All SCI admissions
A	213 (79.48%)	554 (62.66%)
B	25 (9.33%)	126 (14.30%)
C	21 (7.83%)	111 (12.50%)
D	9 (3.36%)	93 (10.54%)
	258	884

Similar results were obtained when Frankel Grades were analysed, whereby a significant predominance of 'A' Frankel Grade ($p < 0.0002$) was shown by patients with PS (Table IV).

The aetiology variable was classified as traumatic, medical and congenital. On comparing both populations, the total and the subpopulation with PS, very similar ratios were obtained with a predominance of the traumatic variable over the others (Fig 2).

On studying other variables, such as civil status, there was some predominance of married patients affected by PS (55.22%) as compared with those who were not married (44.78%). The proportion of severe PS (70%) was the same in both groups.

This study shows that the most frequent anatomical location of PS is the ischial region (28%), followed by the sacral and trochanteric locations (Table V). There were 403 PS distributed amongst 268 patients.

Table VI shows the location of severe pressure sores (grades 3 and 4), which coincides approximately with that of all PS, ischial being the most frequent and severe.

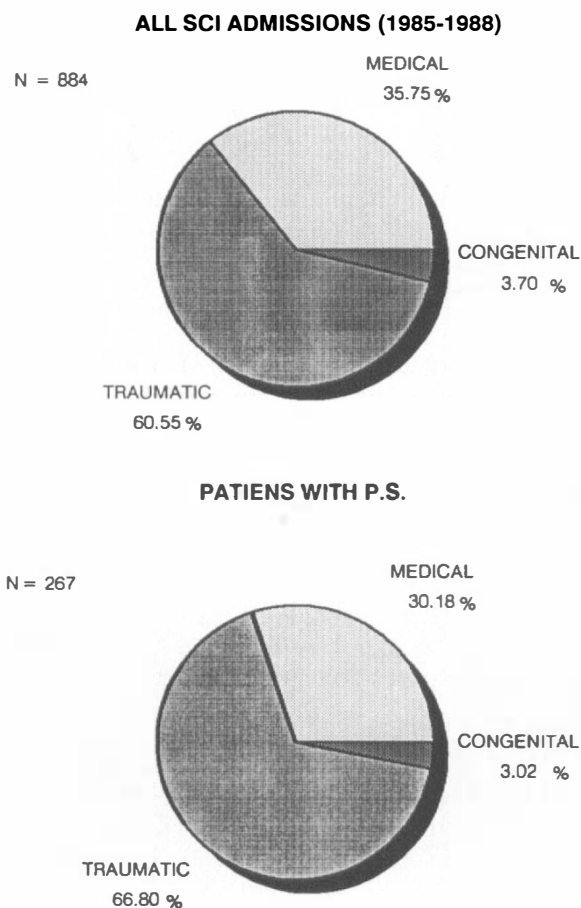


Figure 2 Distribution by aetiology.

Table V Distribution of all pressure sores by grade of Enis and Sarmiento classification

	Severity of pressure sores				%
	1	2	3	4	
Anatomical site					
Sacrum	8	21	17	39	21.09
Ischium	12	22	13	65	27.79
Trochanter	3	14	22	43	20.35
Genital	2	3	1	4	2.48
Knee	0	3	3	2	1.99
Malleolus	1	10	7	2	4.96
Heel	2	1	10	12	6.20
Foot	4	5	8	10	6.70
Others	3	12	12	7	8.44
Total %	8.68	22.58	23.08	45.66	100.00%

Table VI Distribution of pressure sores (grade 3-4)

	Percentage	Number
Ischium	28.16	78
Trochanter	23.47	65
Sacrum	20.22	56
Foot	6.50	18

When taking into account where the patients came from, four groups were considered. Private homes, Nursing homes, Hospital for chronic cases and General Hospitals. About 30% of the cases presenting with pressure sores on admission had been referred from General Hospitals. In these cases the sacral region was the most frequent location (34%) followed by the trochanteric and ischial locations. About 75% of the sacral sores were severe (grades 3 and 4).

Table VII shows the relation between PS and other associated pathologies. This is statistically significant in patients with alcoholism, mental disorders and malnutrition.

Table VIII shows details of regression coefficients and levels of significance of the different variables. The following are given individual consideration.

- (a) The negative result regarding education means a higher severity of PS amongst the less educated sections of the population; reliability: 94%.

Table VII

Associated pathology	Incidence of PS grades 3-4 (%)	T (Student-Fisher)
Mental	78.17	1.888; $p < 0.05$
Alcohol	84.11	2.41; $P < 0.025$
Drugs	87.50	1.51
Scoliosis	79.99	0.841
Fractures	68.00	-0.064
Obesity	70.14	0.20
Malnutrition	78.83	1.40; $P < 0.10$
Anaemia	80.00	0.973
Vascular	75.55	0.857

Table VIII Multiple linear regression analysis

Significative variables	Regression coefficient	Grade of signification
Education	-0.152100	p=0.07
Standing	-0.137082	p=0.06
Spasticity	-0.171292	p=0.01
Urinary infection	0.191759	p=0.02
Referral from hospital	0.207988	p=0.09
Recurrences	0.064057	p=0.0005

- (b) The spasticity variable also yielded a negative result; this means the less the spasticity the more severe the PS; reliability: 99%.
- (c) The urinary infections variable follows the expected pattern: the more severe the pressure sore the greater the number of infections; reliability: 98%.
- (d) One interesting and worrying variable is that regarding where patients came from. The findings showed significantly that those coming from General Hospitals had more serious sores than the others. This calls for information campaigns for the staff of General Hospitals about pressure sore preventive measures and for stress the importance of very early transfer of SCI patients to a spinal cord injury centre.
- (e) With the variable recurrence it has been proved and significantly so, reliability 99.95%, that patients who showed higher recurrences in the past would also show greater severity of PS.

Conclusions

Summarising the multiple regression analysis already commented on, a low and a high risk SCI patient can be depicted as far as PS occurrence is concerned.

A patient with a low risk of developing severe PS would have a high level of education, would practice regular standing, would have spasticity, would not suffer from urinary infections, would usually come from his home and would not have previously suffered from PS.

On the other hand, a patient with a high risk of developing severe PS would have a low level of education, would not practice standing, would have no spasticity, would suffer frequently from urinary infections and would have suffered various recurrences of PS.

All this data, together with that found in the first phase of the study, has served the purpose of designing a profile of the personality and other characteristics of a patient who presents a high risk of developing PS, and which we describe as our conclusion:

A high risk patient would: (a) correspond with an 'A' Frankel grade paraplegia; (b) be a male in 75% of cases; (c) the PS would be more severe if the patient comes from another hospital; (d) there would be a low level of education and a low income; (e) the patient would not practice standing; (f) there would be no spasticity; (g) there would be a history of urinary infections; (h) there would be multiple recurrences; (i) the patient would usually be older than 40 years and would frequently present with other pathologies, such as alcoholism, psychological disorders and malnutrition.

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