

ORIGINAL ARTICLE

Proximal amputation of inferior extremity secondary to recurrent pressure ulcers in patients with spinal cord injuries

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Study design: Descriptive case series study.

Objective: To describe the course of five spinal cord injury (SCI) patients who underwent proximal amputation of the inferior extremity, secondary to recurrent, complicated pressure ulcers (PU) and the clinical impact this intervention had in these patients.

Place: Trabajador Hospital in Santiago, Chile.

Method: Revision of five clinical cases of patients who underwent partial hemipelvectomy or hip disarticulation with amputation of the extremity as treatment for pelvic recurrent PU with chronic secondary osteomyelitis. The clinical impact was quantified as days of hospital stay, number of surgeries and previous and post surgery PU.

Results: After the proximal amputation of the extremity, patients significantly decreased number of days of hospital stay ($P=0.035$), number of surgeries ($P=0.015$) and PU ($P=0.0065$).

Conclusion: Partial hemipelvectomy and hip disarticulation with proximal amputation of the inferior extremity are rescue procedures that can be last resource treatment for chronic recurrent pelvic PU secondary to chronic osteomyelitis.

Sponsorship: Not applicable.

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Introduction

Pressure ulcers (PU) are characterized by a skin necrosis secondary to lack of blood flow due to continuous pressure on arterioles and capillaries.¹ They have well known risk factors such as immobility, decreased sensitivity, fecal and urinary incontinent and age over 65 years, among others.^{2,3}

Patients with a medullar lesion (SCI) have PU more frequently than the general population, since they have many of the risk factor previously mentioned. Former studies estimate that spinal cord injury (SCI) patients have a yearly incidence of PU of 23–33%.^{3–5} These patients have a frequency of 1.62 PU per complete paraplegia a year.⁶ It is estimated that 85% of SCI will have at least one PU during their lifetime and 70% will have multiple lesions.³

According to the National Pressure Ulcer Advisory Panel, Pressure Ulcer Staging System,⁷ the PU are classified as being

superficial, grades I and II, seen in 75% of SCI patients and deep PU, grades III and IV, seen in 6% of these patients.^{4,5} Conservative treatment is used in the management of grade I and II PU, mainly alleviation of pressure and dressings. Surgical procedures are only used in the management of deep grade III and IV PU, including surgical débridement, bursectomy, resection of bony eminences and myocutaneous flaps to cover the defect produced by the lesion.^{1,8}

Four percent of SCI patients have difficult-to-manage recurrent PU that become complicated with chronic osteomyelitis.⁹ When this occurs, patients must be hospitalized for long periods and must undergo multiple surgical procedures that severely decrease their quality of life patients and that of their families.^{10,11}

Hemipelvectomy is a procedure exceptionally performed; it is extreme and generally used in oncological surgery. Mortality associated to surgery is 2–3%.⁵ There are two studies available: Strinden's study (1988) with a series of five SCI cases, where hemipelvectomy and amputation of the lower extremity due to recurrent PU and lack of tissue were

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performed as final-stage treatment. They observed a decrease in the incidence of PU and only one mild complication.¹² There is no mention of relationship to osteomyelitis in this study or other psychological or social factors. The other study is by Chan (2003). This study assessed the value of hemipelvectomy in eight SCI patients as an exceptional treatment measure for complicated PU in septic patients with life-threatening acute osteomyelitis. The study shows a 25% mortality rate, attributed to the poor basal conditions of the patients.⁵

The objective of the present study is to describe the clinical course of SCI patients with PU, who underwent proximal amputation of their lower extremity as a rescue procedure for chronic osteomyelitis secondary to PU and no possibility of being managed with any other procedure, and to compare the clinical impact in these patients after the surgical procedure was completed.

Method

Study design

Descriptive case series study.

Setting

The study was carried out in the Trabajador Hospital in Santiago (HTS), an enterprise of the Chilean Safety Association (Asociación Chilena de Seguridad); a private, non-profit Insurance Company that administers the law that governs work-related injuries and occupational diseases.

For 25 years, HTS has had a multidisciplinary health team for the integral treatment of SCI patients, with a current population of 222 patients, performing prevention, follow up, study and treatment of complications detected in these patients.

Patient characteristics

Five patients with complete traumatic SCI at the thoracic level and secondary paraplegia with a course longer than 10 years were studied in this case series. These patients had recurrent PU in the pelvic area that were very difficult to manage, and after multiple medical and surgical procedures, the proximal amputation of the inferior extremity and a partial hemipelvectomy or hip disarticulation were undertaken as a final treatment to obtain coverage and control the chronic bone infection. In all cases, infection was demonstrated by biopsy. According to the literature, biopsy offers 93 and 99% sensitivity and specificity, respectively; magnetic resonance offers 98% sensitivity and 89% specificity.^{13,14}

Definition of variables. Age, in years, at the moment of the accident.

Completeness and level of SCI, according to the American Spinal Injury Association (ASIA)/International Spinal Cord Society (ISCoS) scales.

SCI time, time in years from the accident to the moment of limb amputation.

Follow up, time in years from limb amputation to September 2005.

Personality disorder, an enduring pattern of inner experience and behavior that deviates markedly from the expectations of the individual's culture, is pervasive and inflexible, has an onset in adolescence or early adulthood, is stable over time, and leads to distress or impairment (DSM IV). The personality disorder was documented with specialized evaluation and personality test (Rorschach's test).

Hospital stay days as well as the amount and type of surgical procedures before and after the extremity amputation were quantified.

Three indices were created in order to compare between SCI patients and before/after the amputation:

- (1) Rate of hospitalization: the quotient between the number of months hospitalized and the number of years of spinal lesion.
- (2) Rate of surgeries: the quotient between number of surgeries and number of years of spinal lesion.
- (3) Rate of PU: the quotient between number of PU and the number of years of spinal lesion.

The following types of surgery were considered: surgical débridement, flaps and other procedures such as colostomies and cystostomies, required due to perineal involvement.

Statistics

The Student's *t*-test was used for paired samples for the before/after comparisons. The results are described as median, quartiles and range. An Alfa statistical level of 5% was used to define the statistical significance of the comparisons. The STATA 9.0 (StataCorp LP, TX, USA) software was used for data analysis.

Results

The five patients in this study were males and at the time of amputation had had more than 10 years of complete paraplegia.

During the first hospitalization due to their traumatic spinal lesion, all developed PU and none collaborated actively in their rehabilitation; on the contrary, they showed self-destructive behavior associated to severe personality disorder. In spite of this, on discharge all were able to achieve independence in their activities of daily living, management of wheelchair and sphincter control. All patients had been discharged from the first hospitalization after completing the SCI Rehabilitation Program and had had no PU.

During the following years, all these patients had hospital stays that were prolonged due to the formation of deep and repeated PU, with an average 2.12 PU per year. These prolonged hospitalizations brought about physical and psychological deterioration of the patients, worsening the self-destructive behaviors and developing depressive and misadaptation states that were very difficult to manage (Table 1).

The decision to perform proximal amputation of the extremity was based on the presence of deep recurrent PU

Table 1 Characteristics of the SCI patients studied

Patient	General data		Pre-amputation		Type of amputation	Post-amputation	
	Age (years)	Level of complete paraplegia	Time SCI (years)	No. PU		Follow-up (years)	No. PU
1	21	T11	14	36	Partial left hemipelvectomy	3	0
2	24	T8	28	81	Partial left hemipelvectomy	2	1
3	24	T5	19	57	Right hip disarticulation	9	1
4	38	T11	17	7	Left hip disarticulation	10	1
5	39	T8	13	22	Partial right hemipelvectomy	0.8	0

Abbreviations: PU, pressure ulcers; SCI, spinal cord injury.

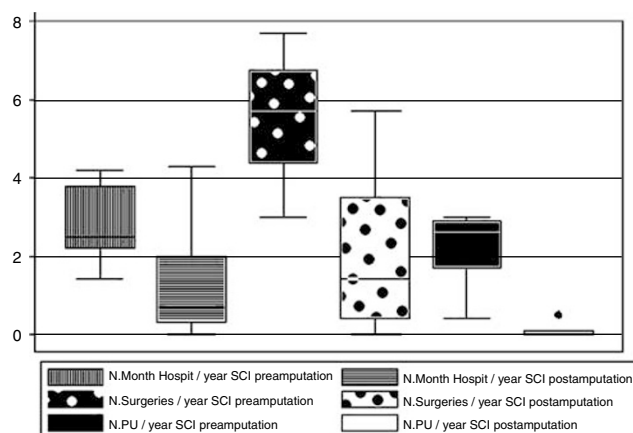


Figure 1 Hospitalizations, surgeries and PUs before and after amputation. PU, pressure ulcers.

complicated by extensive chronic osteomyelitis, where all available flaps were used. The skin obtained by the amputation provided the necessary cutaneous tissue to cover the defect after removing the infected bone tissue. From a functional standpoint, the extremity amputation facilitated tissue transferences and bed turns (changes of position from supine to lateral and pronus by the patient).

Since the surgical treatment of the chronic infection was not emergency surgery, patients were fed a hyperproteic diet until an adequate preoperative protein level was obtained, therefore facilitating good scarring.

The lower extremity amputation had no major complications and the five patients survived the procedure. Two hip disarticulations and three partial hemipelvectomies were performed (Figures 2–4). In Table 1 and Figure 1, the number of PU are described, as well as evolution time before and alter the operation.

Patient 1 suffered a wound dehiscence that became a chronic wound. After a year of conservative treatment, the lesion was covered with a free musculo-cutaneous flap (latissimus dorsii).

Table 2 and Figure 1 show the significant decrease in hospital stay, surgical procedures and PU after amputation.

We highlight that patients 3 and 4, both with a hip disarticulation type amputation, have longer post amputation follow-up periods than the other patients, and have had significantly less PU, hospital stays and less surgical procedures performed.

Table 2 Hospitalizations, surgeries and PU before and after amputation

Patient	Hospitalizations (months hospital/year SCI)		Surgeries (no. surgeries/year SCI)		PU (no. PU/year SCI)	
	Before	After	Before	After	Before	After
1	3.8	4.3	7.7	5.7	2.6	0
2	4.2	2	4.4	3.5	2.9	0.5
3	2.2	0.3	3	0.4	3	0.1
4	1.4	0.7	5.7	1.4	0.4	0.1
5	2.5	0	6.7	0	1.7	0
P-value	0.0354		0.0155		0.0065	

Abbreviations: PU, pressure ulcers; SCI, spinal cord injury.



Figure 2 Left partial hemipelvectomy radiograph of patient.



Figure 3 Left hip disarticulation radiographic image of patient.

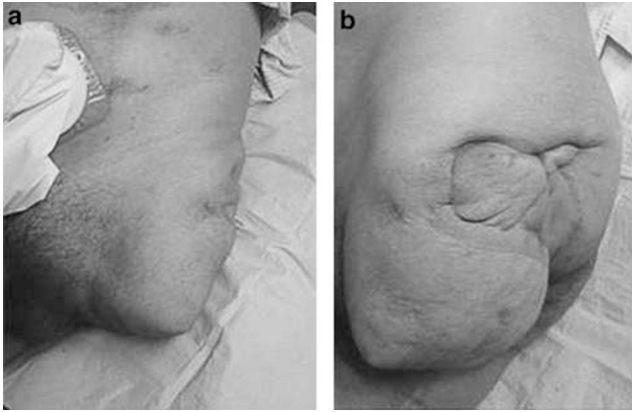


Figure 4 Amputation-type hip disarticulation in patient 4.

All patients used a wheelchair cushion with interconnected air cells. The interphase pressure between cushion and patient was periodically assessed.

Conclusions

There is little information in the literature about incidence and prognosis of PU in SCI patients. According to the existing literature in this regard, PU are more frequent and have a worse prognosis than that of non-SCI patients.^{10,11}

In some SCI patients, negligence in skin care associated to depressive states, neurotic-anxious personality and low satisfaction in their daily life have been described.^{9,10} This condition, present in less than 1% of the SCI patients, has been called 'ectodermic syndrome' and presents several characteristic psychological elements.¹¹ It is described as a negation of the SCI with facts, associated with the incapacity of understanding the condition and reflected in a lack of attention in skin self-care.¹¹

In a previous study by Correa *et al.*¹⁵ it was seen that SCI patients with personality disorder had a greater risk of having PU. This disorder could condition the loss of periodic standing-up and changes in body weight, all considered risk factors for PU in patients with complete paraplegia.

The patients in this study correspond to 2.3% of SCIs cared for in the hospital, and the five cases had severe personality disorders with self-destruction actions and a longer history of PU than their pairs. On average, they have 2.12 PU per year, more than that described in the literature that is 1.62 PU per year for patients with the same level of SCI.⁶

Due to the characteristics described above, the proximal amputation of the extremity was a procedure by exception. After the procedure, a decrease in the number of PU, procedures and hospital stays secondary to these lesions was observed. This would not only be due to the elimination of the infectious focus but also to multiple physical and psychological factors.

Physical factors include the ease of body management by decreasing the immobile weight under the lesion.

Psychological factors that may be implied in this improvement would probably lead the patient to confront the

consequences of lack of self-care with a tangible and esthetically significant loss. All our patients after the procedure presented a more responsible attitude in their care of their skin. Freud describes in his complete works the so-called 'negative therapeutical reaction', where patients are opposed to healing that is feared. They have a prevalent need of being ill. The obstacle for recovering shows that they are more powerful, more than the others (narcissistic inaccessibility), with a negative attitude toward the physician and anchored to the profit of the disease. A guilt feeling that is satisfied by the disease and does not want to renounce the punishment of suffering.¹⁶ Then, there is an extreme form of masochism, a disease that is refractory to all treatment and that can disappear if the person falls into a major misfortune (separation, economical loss or severe illness). In this type, one form of suffering has been relieved by another.¹⁷

The patients in this study, having had a basic psychological elaboration of their problem, require a more substantial care by the health team, and so minor interventions are insufficient. This care becomes real when the infectious focus is eliminated with the extremity amputation and the ensuing physical change is achieved, eliminating their 'diseased part'. Seen under more modern behavioral theories such as those developed by Klein^{18,19} and Kissen,²⁰ the patient may be considered to live this major surgical intervention as an object relationship, predominantly of love, remaining in deep debt with the health team and humanity as a whole, the pulsation of life being reactivated in them, as well as self-care; gratitude allows the patient to suppress the self-destructive behaviors. This experience of extreme care leads patients to avoid harming themselves.

A mortality of 2–3% has been described for hemipelvectomy in patients without neurological damage.⁵ In our series there was no demise, and this may be due to the patients being stable, in spite of having a chronic infection under treatment. An adequate nutritional level was obtained before the surgery for a correct wound closure. The literature describes 26% reintervention. Our series showed one surgical complication (20%), and this was a chronic wound in patient 1, which required later coverage.⁵

We have to point out that the patients are not totally comparable among each other, since there are different amputation follow-up times. We used correction factors in our series to decrease this difference. In this way we were able to note a trend toward less PU that must be considered when facing this type of patients where radical surgery would not only be efficient as a treatment of the PU but would also decrease the future occurrence of PU by multiple physical and psychological factors that we do not fully understand yet.

We highlight that there is a difference in the postoperative course of the patients who underwent hip disarticulation and partial hemipelvectomy. We think this difference was not only due to chance but probably is also related to the fact that the surgery was timelier for the first patients with preservation of the pelvic ring. This outlining must be proven in the future with studies that have at least 10 or more subjects per type of surgery and are properly designed.

This study is not representative of the entire SCI population; this is an infrequent group of patients where an

extreme rescue measure had to be taken, and the results were superior to those expected, with an improvement in the physical, psychological and social condition of the patients.

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