

EPIDEMIOLOGICAL PROFILE AND TREATMENT OF PRESSURE SORES: EXPERIENCE WITH 77 CASES

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SUMMARY

Prolonged tissue compression due to sitting, lying or wearing braces in a healthy person results in discomfort and pain due to local ischemia. The normal protective pathways are interrupted in paraplegics, tetraplegics, or the signals are ignored in severely debilitated, elderly or chronic ill patients. The pressure sore develops in these patients.

Few papers have been done in Brazil about pressure sores, despite economic problem involved with.

The purpose of this paper is to evaluate the epidemiology, treatment and complications of pressure sores in the Hospital das Clínicas (University of São Paulo) from February 1997 to March 1999 in the Orthopedics Institute.

A prospective study has been done. Data were evaluated as to the gender, age, sites, classification, type of treatment employed, length of stay and complications. The treatment was evaluated

by the success rate and recurrence rate. The average follow-up period was 1 year and a half, ranging from 6 months to 2 years.

77 pressure sores in 45 patients were appraised. 36 men and 9 women, age range 17-64, mean 34,78 years. Of the patients, 100% had severe spinal cord injuries, and most of them victims of gun shot (60%). 93,3% of the wound were chronic (present longer than 3 months).

77,92% were treated by surgical procedures, and most of them with myocutaneous flaps (45%).

The success rate changed with the site of the lesion: 80% trochanter, 84% sacrum and 66,6% ischium.

The recurrence rate was 25%. The complication rate also changed with the site of the lesion: 84% trochanter, 64% sacrum and 50% ischium.

Keywords: Pressure sores; Treatment; Epidemiology.

INTRODUCTION

Pressure sores are those resulting from local tissue ischemia triggered by pain reflex changes in patients with spinal cord injuries (tetraplegic, paraplegic or hemiplegic) or in debilitated, elderly or chronically ill patients. In patients with spinal cord trauma, there is lesion of the afferent nociceptive fibers, which are responsible for painful stimulus for decubitus changes, and, in the second group of patients, those signs are ignored^(1,2,3).

The etiology of pressure sores is still not so clear, but it is known that continuous pressure on the skin leads to ischemic phenomena associated to nutrients deficiency, and consequently, to tissue necrosis⁽⁴⁾. Sores may develop in areas where pressure is applied on bone protuberances, such as the sacrum, ischium, trochanter, or, less frequently, the calcaneus, occipital region, foot dorsum, malleolus, and patella^(5,6,7,8).

Studies indicate that pressures between 60 and 580 mmHg during a period of 1 to 6 hours may cause a sore. In addition to pressure, shear and friction forces may act in synergy to the development of a sore in undernourished, incontinent, lying or mentally-ill patients⁽⁴⁾.

Uncountable classifications are proposed for pressure sores. The most used classification is that of the National Center of Spinal Cord Injuries Data^(9,10,11), where four progressive stages of tissue lesion are described^(10,12).

Pressure sores can develop within 24 hours or their onset can take up to 5 days. All healthcare professionals responsible for patient follow-up should be familiar with the main risk factors. In this sense,

taking prophylactic measures to eliminate continuous pressure, shear or friction forces is crucial to prevent sores formation⁽⁴⁾.

The prevalence of pressure sores in a hospital environment is extremely high, ranging from 2.7%⁽¹³⁾ to up to 29.5%^(14,15,16). Tetraplegic patients (60%)^(13,16) and the elderly having femoral cervix fractures (66%)^(16,17) reach the highest complication rates, followed by critically ill patients (33%). In general, approximately 40% of patients with spinal cord injuries achieving completeness of treatment will develop a pressure sore^(16,18). As the elderly population tends to grow in our environment, outpatients with homecare are recognized as having a high risk to develop decubitus sores⁽¹⁰⁾.

With an estimated elderly population of 1.5 million living in long-term admission institutions in the USA, pressure sores are becoming deeply important, since 25% - 33% of patients entering in institutions present with pressure sores and approximately 35% of patients will develop sores sometime during their stay⁽¹⁰⁾.

Pressure sores are infrequent direct causes of death in paraplegic patients, with an incidence of 7% - 8%⁽²²⁾.

The economic impact of the pressure sores treatment is astonishing. Recent estimates on treatment costs (clinical and surgical) for pressure sores reveal an average hospital cost of US\$ 21,675. In addition to that, when a patient with femoral cervix fracture develops a pressure sore, hospital burdens increase by US\$ 10,986 in average for each patient⁽¹⁶⁾. For the surgical patient, the great impact on hospitalization costs seems to be the presence or the absence of post-operative complications, which can significantly change the hospitalization period and, consequently, hospitalization costs⁽¹⁶⁾.

Study conducted by the Plastic Surgery Division and the Orthopaedics and Traumatology Institute - Hospital das Clínicas, FMUSP

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In Brazil, just a few studies are being conducted regarding pressure sores and their treatment. The objective of this study is to evaluate the epidemiological distribution, treatment and complications of pressure sores at the Orthopaedics and Traumatology Institute of the Hospital das Clínicas, Medical School, University of São Paulo, during the period of February 1997 to March 1999.

MATERIALS AND METHODS

During the period of February 1st, 1997 to March, 1st, 1999 (25 months), a prospective study of hospitalized patients with pressure sores was conducted at the Orthopaedics and Traumatology Institute of the Hospital das Clínicas, Medical School, University of São Paulo. A protocol was established aiming to evaluate the following items: gender; age; risk factors; site; sizes and classifications of pressure sores, kind of treatment, post-operative complications, chronicity, hospitalization time, success and recurrence rates.

Concerning the risk factors, an evaluation was made regarding which group the patient belonged to: a) spinal cord injury – kind of injury (tetraplegia, paraplegia or hemiplegia) and the trauma mechanism (gun shot, car accident, domestic accidents); b) lying patients without spinal cord injury – debilitated, elderly, chronically-ill, undernourished patients; c) incontinent – vesical or fecal, and; d) mentally ill patients⁽¹⁰⁾.

Regarding sores sites, the following regions were evaluated: sacrum, ischium, trochanter, calcaneus, knee, occipital region, foot dorsum, malleolus, shoulder, chest, leg, calf, lumbar, and occipital region. Concurrently, measurement of the sores was made in its largest diameter (cm).

Sores were classified according to the National Center of Spinal Cord Injuries Data (Class I – lesions limited to the superficial epidermis and dermis, Class II – lesions involving the skin in its total thickness and subcutaneous cell tissue, Class III – lesions extended up to the muscle plane and Class IV – where there is destruction of all tissues (soft parts) with the involvement of bones and joints^(10,12)).

Regarding the kind of treatment, conservative or surgical treatment was selected. From the surgical options, there were the following possibilities: skin graft; skin, muscle, myocutaneous, fascial, and fasciocutaneous flaps, and; border-border primary closing.

Treatment was evaluated by the success and recurrence rates of the pressure sores. Success rate was considered as sore healing in one month following surgical procedure⁽⁹⁾. Recurrence rate was determined by the recidivism of lesion after healing within a period of time longer than one month.

Concerning post-operative complications, their presence or not was evaluated, and were differentiated by: post-operative infection, both in the surgical site and in grafts or flaps donor areas; hematoma; suture dehiscence – minor, when extension was shorter than 3 cm, and major, of which extension was longer than 3 cm; flaps necrosis – total (> 30%) or partial (<30%); total or partial graft losses; seroma and malign degeneration.

Sores were considered as chronic if time elapsed from onset was longer than 3 months⁽⁹⁾.

RESULTS

During the period of February 1st, 1997 to March 1st, 1999 (25 months), 45 patients were hospitalized: 36 males and 9 females, with ages ranging from 17 to 64 years old, average of 34.78 years old.

Regarding risk factors, 100% of the patients (n=45) presented with spinal cord injuries, 60% (n=27) due to gun shots, 31.1% (n=14) due to car accident, and 8.2% (n=4) due to domestic accident

(high falls). Seventy-seven point seven per cent (n=35) presented with paraplegia and 22.3% (n=10) presented with tetraplegia.

Seventy seven pressure sores were found in a site-related distribution, according to Charts 1 and 2:

32.47% (n=25) of the patients presented with sacrum sores, 32.47% (n=25) trochanter sores, 15.58% (n=12) ischiatic sores, 5.18% (n=4) knee sores, 3.90% (n=3) calcaneus sores, 2.60% (n=2) leg, shoulder and lumbar region sores, and 1.30%(n=1) at chest and occipital regions.

On average, the number of sores found by patient was 1.71.

Regarding the classification by the National Center of Spinal Cord Injuries Data, 67.53% (n=52) were Class IV, 10.37% (n=8), Class III, and 22.08% (n=17) Class II.

77.92% of sores (n=60) were surgically treated, while 22.08% (n=17) were treated by a conservative approach.

From the sores conservatively treated, the distribution is given according to site: 6 at the trochanter, 4 at sacrum, 3 at the knee, 1 at shoulder, 1 at calcaneus, 1 at the leg and 1 lumbar.

Sixty surgical procedures in 45 patients were performed and distributed according to Chart 3:

45% (n=27) of surgical procedures performed were myocutaneous flaps, 28% (n=17) border-border closings, 13% (n=8) skin grafts, 12% (n=7) skin flaps, and 2% (n=1) fasciocutaneous flaps.

Distribution of the kind of treatment according to pressure sore site is shown on Tables 1, 2, 3 and 4:

Tensor flap of the fascia lata in V-Y was used in 68% of the trochanteric sores (n=17) (Figures 1 - 5). In patients with sacral sores, border –border closing and gluteus maximus flap in V-Y achieved 28% (n=7) (Figures 6 - 9). Border-border closing was performed in 75.1% (n=9) of patients with ischiatic sores, and, in one patient, a reconstruction was performed with gracile myocutaneous flap (8.3%) (Figures 10 - 12).

By analyzing the kind of implemented treatment, we have: from the 8 grafts inserted, 3 were sacral sores, 2 at calcaneus, 1 at knee, 1 at leg, and 1 at calf. From the 17 border-border closings, 9 were performed on ischiatic sores, 7 sacral, and 1 trochanteric. From the 7 skin flaps performed, 1 intended to close a trochanteric sore, 3 sacral, 1 occipital, 1 chest and 1 lumbar. From the 27 myocutaneous flaps, 17 were performed on trochanteric sores for closing, 8 sacral, and 2 ischial. A single fasciocutaneous flap was performed on an ischiatic sore.

Regarding the diameter (in its longer axis) of pressure sores, according to the site, we have: a)sacral - 3 to 20 centimeters, with an average of 9.5 centimeters; b) trochanteric- 3 to 34 centimeters, with an average of 9.5 centimeters; c) ischiatic - 4 to 10 centimeters, with an average of 8 centimeters.

Complications of surgical procedures were differentiated according to tables 5, 6, 7, 8, 9 and 10, listed below:

Partial losses (smaller than 30%) of flaps occurred in: 41.17% (7/17) of patients submitted to Fascia Lata Tensor flap in V-Y in the treatment of trochanteric sores and 14.28% (1/7) of the patients submitted to Gluteus Maximus flap in V-Y in the treatment of sacral sores. No partial losses were seen in the border-border closing (8/12) of ischiatic sores.

Total losses (bigger than 30%) of flaps occurred in 5.9% (1/17) of the patients submitted to Tensor Fascia Lata flap in V-Y in the treatment of trochanteric sores and in one case of femoral biceps flap used for the reconstruction of a ischiatic sore.

Minor dehiscences (smaller than 3 cm) occurred in 5.9% (1/17) of the patients submitted to Tensor Fascia Lata flap in V-Y for trochanteric sore treatment, 42.9% (3/7) of the patients submitted to Gluteus Maximus flap in V-Y for sacral sore treatment, and 11.1% (1/9) of patients submitted to border-border closing for ischiatic sore treatment.

There were no cases of major dehiscences. Regarding general complications at post-operative period, we noticed: hematoma in 8.3% (5/60), seroma in 3.3% (2/60), and infection in 25 % (15/60) of cases. No malign degenerations were seen on surgical site.

Treatment success rate was 66.6% (8/12) for ischiatic sores, 84% (21/25) for sacral sores, and 80% (20/25) for trochanteric sores.

Overall complication rate was 50% for ischiatic sores (6/12), 64% for sacral sores (16/25), and 84% for trochanteric sores (21/25).

Recurrence rate was 25%, being 50% for ischiatic sores.

93.3% of the sores treated were chronic (42/45). Average hospitalization time was 88 days.

DISCUSSION

There are many terms inappropriately used for pressure sores, such as decubitus sores, lying sores, ischemic sores and eschar. The term "decubitus sore" is derived from Latin decumbere, which means "to lie down", the same happens with "lying sores". Such terms do not appropriately describe the physiopathology of the pressure sore. "Ischemic sores" result from arterial lesion. The term "eschar" describes the devitalized tissue covering the sore⁽¹¹⁾.

Comparing our data to those of the Medical Service of the University of California, in San Francisco⁽⁹⁾ (16 years) and to the Medical Service of the University of Japan, in Hokkaido⁽¹⁹⁾ (5 years), the period of study presented here is short. Nevertheless, when we evaluate the number of sores in comparison to treatment time, we can see a higher rate at the University of São Paulo (38.5 sores/year). At the University of California⁽⁹⁾, this rate is 12.6 sores/year and at the University of Japan⁽¹⁹⁾ is 10.6 sores/year.

When analyzing the number of sores by patient, we see a rate of 1.7 sores by patient at the Medical School of the University of

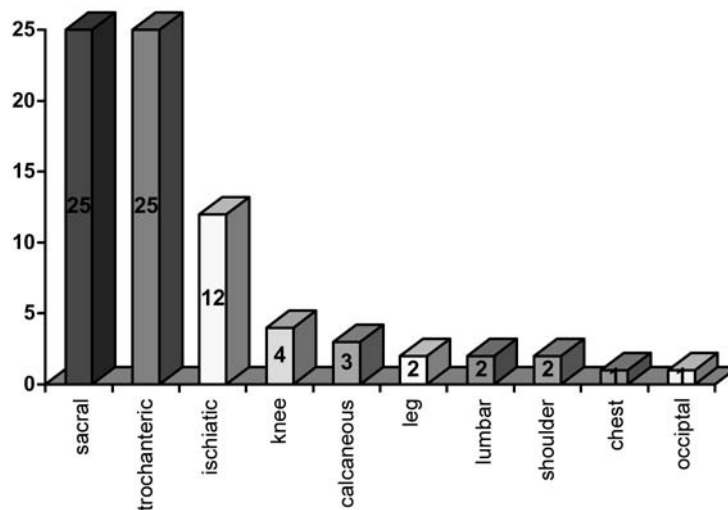


Chart 1 - Numeric distribution of pressure sores according to site

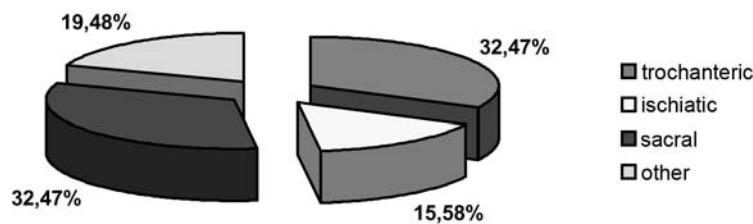


Chart 2 - Distribution by percentage of pressure sores according to site

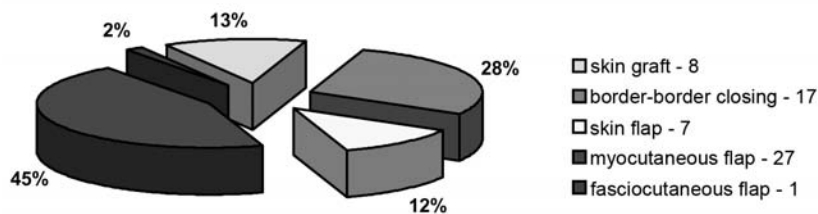


Chart 3 - Distribution of surgical procedures for pressure sores

São Paulo (77/45), 0.7 sores by patient at the University of California⁽⁹⁾ (201/280) and 1.3 sores by patient at the University of Japan⁽¹⁹⁾ (69/53). This finding may be explained by a lower level of local care or unfavorable systemic conditions of the patients evaluated in this study because of their poor social conditions. Regarding patients' ages analysis, we found a younger group in our study (17 - 64 years old, average 34.78) than in the University of California⁽⁹⁾ (16 - 90 years old) and in University of Japan⁽¹⁹⁾ (17 - 75 years old), both with an average of 50 years old. We assume that the reason for this younger average age is due to the high urban violence rates with a great number of young victims of gun shots.

Concerning patients' gender, we see a male: female ratio of 4:1, higher than in the Medical Service of the University of California⁽⁹⁾ (1.8:1) and lower than in the Medical Service of the University of Japan, in Hokkaido⁽¹⁹⁾ (9.6:1).

Regarding risk factors, 100% of the patients presented with spinal cord injuries, being 77.7% paraplegic and 22.3% tetraplegic. In San Francisco⁽⁹⁾ 86% were paraplegic and 4% tetraplegic. 60% of

patients in Hospital das Clínicas were victims of gun shots and 31.1% of car accidents. In Japan⁽¹⁹⁾, 71% of spinal cord injuries were due to trauma.

In 1964, Dansereau and Conway published the results of an assessment with 649 patients, accounting for 1604 pressure sores⁽¹⁸⁾. The authors noticed that the great majority of the pressure sores develop at the lower half of the body, being two thirds at the hip and breech region and one third at lower limbs. Other later studies confirmed this anatomic distribution⁽¹⁸⁾.

In this study, we noticed a huge difference in the distribution of sore sites compared to other medical services. In this series, we

have the following distribution: 32.47% of the sores are in the sacral region, 32.47% at the trochanter, and 15.58% at ischiatic regions. In the Medical Service of the University of California⁽⁹⁾ the following is shown: ischiatic sores (40%), sacral sores (34%), and trochanteric sores (26%). In the University of Japan⁽¹⁹⁾ distribution is as follows: ischiatic sores (65.2%) and sacral sores (34.8%), with those data presenting a match regarding order, but not regarding frequency, with University of California's Medical Service data⁽⁹⁾. This sore distribution difference deserves more detailed studies.

Concerning the classification by the National Center of Spinal Cord Injuries Data^(10,12), 67.53% (n=52) belonged to Class IV, while 10.37% (n=8) belonged to Class III and 22.08% (n=17) to Class II.

This classification is valuable when compared to the results achieved with the various treatment methods, although it is worthy to remember that skin manifestations of pressure sores are only the "tip of the iceberg".

While skin changes occur, the sore in a deep plane can be much bigger, since the

deeper the tissue, the more intense the effects of pressure, reaching its maximum degree near bone protuberance⁽¹⁰⁾. This is of crucial importance for treatment standardization. Some authors advocate that some Class I and II pressure sores can be treated in a conservative manner and Class III and IV injuries must be surgically treated⁽²¹⁾.

Pressure sores treatment can be divided into systemic and local, and the latter can be further divided into conservative and surgical. Whatever the treatment is, it is mandatory that pressure relief and prophylactic measures continue to be used⁽²⁰⁾.

The first step after pressure relief and wound cleaning is the recovery of patients' nutritional status. Used measures vary regar-

Treatment	# of Cases	% of Cases
Border-border closing	1	4.0%
Double-helix skin flap	1	4.0%
Fascia Lata Tensor Flap in V-Y	17	68.0%
Conservative	6	24.0%
TOTAL	25	100.0%

Table 1: Treatment of trochanteric sores

Treatment	# of Cases	% of Cases
Skin graft	3	12%
Border-border closing	7	28%
Advancing surround skin flap	3	12%
Gluteus Maximus flap in V-Y	7	28%
Fascia Lata Tensor rotation flap	1	4%
Conservative	4	16%
TOTAL	25	100.0%

Table 2: Treatment of sacral sores

Treatment	# of Cases	% of Cases
Border-border closing	9	75.1%
Gracile flap	1	8.3%
Gluteus Maximus flap	1	8.3%
Fasciocutaneous flap	1	8.3%
TOTAL	12	100.0%

Table 3: Treatment of ischiatic sores

Sore site	Treatment	# of Cases	% of Cases
Calcaneus	Skin graft	2	66.6%
	Conservative	1	33.3%
Occipital	Advancing skin flap	1	100%
Chest	Double-helix skin flap	1	100%
Lumbar	Skin rotation flap	1	50%
	Conservative	1	50%
Leg	Skin graft	1	50%
	Conservative	1	50%
Calf	Skin graft	1	100%
Knee	Skin graft	1	25%
	Conservative	3	75%
Shoulder	Conservative	1	100%

Table 4: Treatment of other kinds of pressure sores

ding lesion chronicity and patient's general status. The administration of a hyperproteic, hypercaloric and vitamin-rich diet is of crucial importance. In the presence of hypoproteinemia, the evolution of pressure sores is fast, and healing is slow. When nitrogen positive balance is restored, damaged tissue healing is facilitated and a supplementary enteral diet or supernourishing may be necessary⁽²⁰⁾. Unless the levels of serum protein are above 6mg/100 ml, surgery should not be performed, except in cases where patient's life is in danger.

Anemia correction occurs concurrently to the proteic deficiency correction. A combination of diet, drug therapy and blood transfusion may be necessary. Repeated total blood transfusions may be required twice or three times a week, not only during the pre-operative period, but also during intra- and post-operative periods, so as to maintain serum hemoglobin levels above 12 mg/ml⁽²⁰⁾.

Infection, both at lesion site and far from it, must be eliminated as soon as possible.

Local treatment can be divided into conservative and surgical.

Some authors advocate that some pressure

sores (Class I and II) can show spontaneous healing with no surgical intervention, provided the wound is thoroughly cleaned and pressure on the area is prevented⁽¹⁰⁾. If the sore is not so big, it will be filled from the deep, and the epidermis growth around it will close the wound. However, this cicatricial tissue layer is not satisfactory due to the vulnerability associated to minimal trauma or daily activities.

Previous studies show that pressure sores cleaning with soap and water or any other surfactant means is a simple and effective way to clean superficial lesions, provided it is frequently performed, and preferably, it is kept dry. The skin surrounding sore can also be protected with thick patches in order to prevent skin maceration⁽¹⁰⁾.



Figure 1 – Planning of fascia lata tensor flap in v-y



Figure 4 – Trochanteric sore

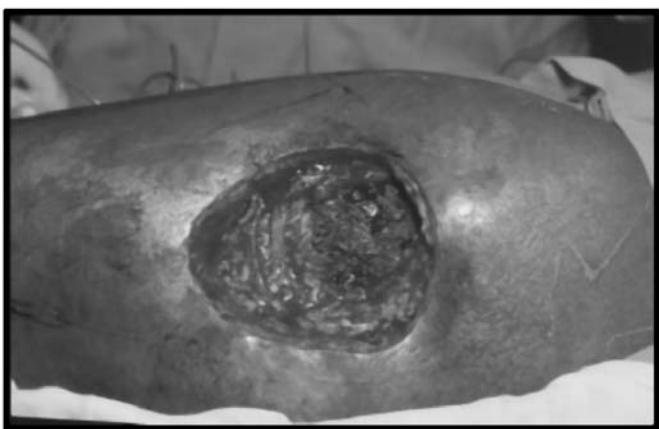


Figure 2 – Trochanteric sore after debridement



Figure 5 – Sore repair with fascia lata tensor flap in v-y



Figure 3 – Result after pressure sore closing (graft not required)

In general, the quality of the skin regenerated by conservative treatment is thin, with no sebaceous or sudoriparous glands. The epithelium is usually dry and with poor blood nourishment and must be frequently lubricated with petrolatum and moisturizing creams.

With the conservative treatment, the time for sore closing is long, and, additionally, there are short morbidity periods, due to slight traumas with skin rupture. Due to those factors, surgical treatment provides the best prognostic in terms of early closing and of ability to stand further traumas. There is no doubt that only a small percentage of pressure sores can be treated in a conservative approach⁽¹⁰⁾.

Class III and IV sores usually need a surgical treatment. The high recurrence rates frequently associated to conservative treatment of pressure sores are mentioned as justifications for surgical treatment of Class III and IV sores, being more appropriate and less morbid for the patient. Conservative measures, consisting of local debridement, reduction of local pressure and daily changes of dressings are little efficient once a chronic sore is developed. 77.92% of the sores (n=60) were surgically treated and 22.08% (n=17) were treated by using a conservative approach in this study. 45% (n=27) of performed surgical procedures were myocutaneous flaps, 28% (n=17) border-border closings, 13% (n=8) skin grafts, 12% (n=7) skin flaps, and 2% (n=1) fasciocutaneous flaps.

For patients with pressure sores, surgery objectives are not limited to: a) defect repair by reducing protein loss through the wound; b) prevent progressive osteomyelitis and sepsis; c) avoid secondary progressive amyloidosis and kidney failure; d) reduce rehabilitation costs; e) improve patient's appearance and hygiene; f) prevent a potential Marjolin sore⁽¹⁰⁾.

In 1956, Conway and Griffith⁽⁹⁾ published their experience with pressure sores and their treatment. They establish many guidelines, which, with subtle modifications, are still valuable today.

Patient positioning should be made so that a larger possible portion of the sore surface is exposed, in order to minimize tension on suture thread when the operated area returns to its rest position.

Adequate delimitation of sore boundaries is important, particularly in cases of fistulas, where sometimes the use of methylene blue is required⁽¹²⁾.



Figure 6- Sacral sore with planning of gluteus maximus myocutaneous flap in single v-y

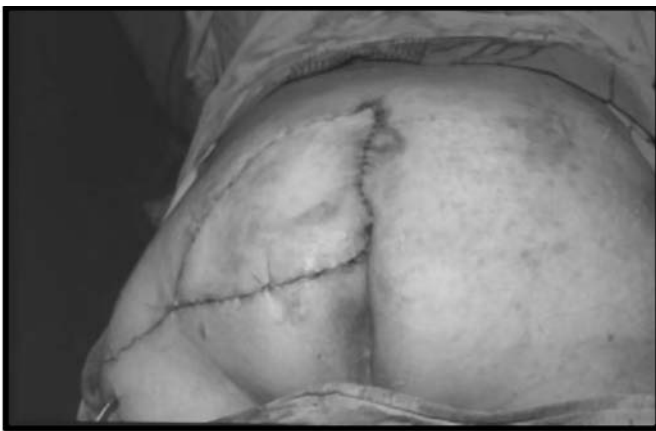


Figure 7- Immediate post-operative period after advancement of gluteus maximus myocutaneous flap in single v-y



Figure 8 - Sacral sore

The thorough excision of the sore must be performed, removing all devitalized material and all thickness of a non-intact skin. This must include the pseudobursa excision, particularly in cases of fistulas, where a fistulography with radiopaque contrast injection and intra-operative marks with methylene blue may be required. Exposed and infected bone tissue removal is recommended, but the thorough osteotomy must be avoided, because it leads to additional problems, such as excessive bleeding, skeletal instabi-



Figure 9 – Immediate post-operative period after advancement of flaps for sore closing

lity and pressure points redistribution to adjacent areas. Calcified soft tissues resection must also be done, if existent⁽²⁰⁾.

The hemostasis must be rigorous, in order to avoid hematoma formation with subsequent infection and reconstruction damages. Hematoma formation is the most frequent surgical complication. Vacuum drainage is other essential factor, which aims to minimize hematoma and seroma formation⁽¹²⁾.

Reconstruction should be made with regional pediculated flaps so as to fill in dead spaces with fascia or muscle tissue.

In the pressure sores reconstruction, detailed planning of flaps is essential. First, the flap must be as large as possible, so as to position suture thread far from direct pressure area. Besides, selected reconstruction option should not jeopardize other options in case of recurrences, and, also, flaps construction can enable their reuse sometimes.

After flaps construction, it is important that the donator area is closed without tension, avoiding suture threads to be placed in support areas. Closing may be primarily performed, or a graft with thick partial skin may be placed, if possible.

Reconstruction procedure selection depends on many factors, such as the level of spinal cord injury, sore site, previous sores and surgeries history, potential outpatient status, daily habits, educational status, motivational level and other associated medical problems. Selecting among random skin flap, muscle flap and skin graft, pediculated myocutaneous flap or free flap is usually difficult.

Ischiatic sores are known to show a high recurrence rate, almost reaching 50%⁽¹⁹⁾. The plastic surgeon, therefore, must be aware of this fact when selecting an appropriate surgical procedure.

Many kinds of flaps have been proposed on the reconstruction of ischiatic sores, being fasciocutaneous and myocutaneous, which can belong to the thigh or gluteus region, including the gluteus maximus, posterior muscle of the thigh, hamstring, femoral biceps, tensor of the fascia lata, gracile, rectus abdominalis, and anterior thigh flaps. Despite this great variety of options, ischiatic sores remain as the most difficult kind of sore in achieving an effective treatment⁽⁹⁾. Some authors have recommended total ischiectomies to those sores, whether they are associated to myoplasty or not⁽²⁰⁾. Bilateral ischiectomy has also been proposed, but with a perineal sore formation, which can be complicated by urethral diverticulum formation and subsequent fistula formation .

The first-option surgical treatment adopted in this series for ischiatic sores was the border-border closing (75.1% of cases) with a success rate of 66.6%. The Medical Service of the Univer-



Figure 10 – Ischiatic sore in paraplegic patient with fasciotomy incisions in anterior and posterior planes of MMIID

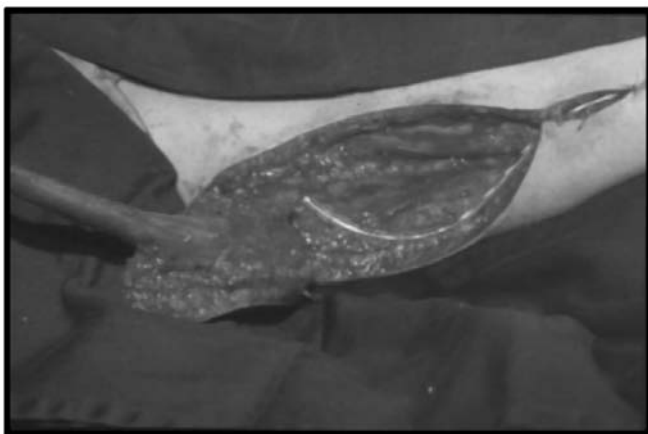


Figure 11 – Gracile myocutaneous flap release

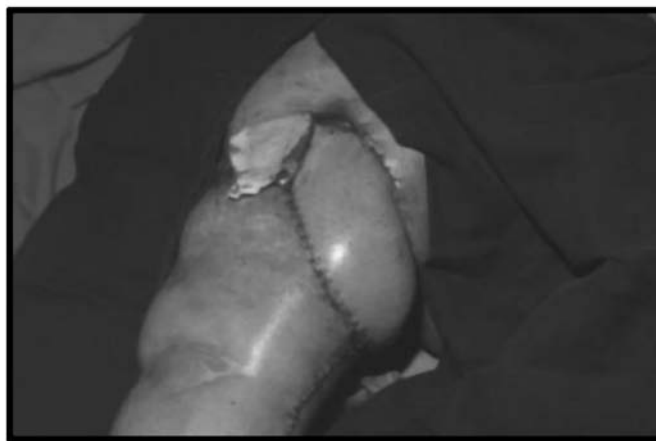


Figure 12 – Ischiatic sore closing with gracile myocutaneous flap

sity of California uses as first option the myocutaneous flap of lower gluteus maximus in island and as the second option the gluteus flap with a success rate of 83%. The Medical Service of the University of Japan uses as first option the hamstring myocutaneous flap and as a second option the thigh posterior fasciocutaneous flap, with a success rate of 51.5%.

Numerous options exist for the surgical treatment of sacral sores, which can include the use of adjacent sacral, gluteus or lumbar tissues, which, in turn, may comprise the gluteus maximus muscle or not.

Before treatment plan is defined, it is advisable to consider if the patient is an outpatient or not, and if certain muscle functions (such as the gluteus maximus muscle) should be maintained. If the patient remains in bed, the reconstruction option must be more durable and stable. In outpatients with superficial sores, options can include primary closing (if possible), skin graft, fasciocutaneous rotation flap, fasciocutaneous flaps based on gluteus or intercostal perforans or a myocutaneous flap preserving muscular function, such as the myocutaneous flap in V-Y or rotation flap. The rotation myocutaneous flap of the gluteus maximus muscle significantly compromises muscular function, particularly when climbing stairs⁽¹⁰⁾.

In the treatment of sacral sores, the first option was the myocutaneous flap of the gluteus maximus in V-Y (28%) as well as the border-border closing (28%), with a success rate of 84.0%. The Medical Service of the University of California also uses the myocutaneous flap of the gluteus maximus in V-Y as the first option, with second option being island-like gluteus flap (success rate 91%). The Medical Service of the University of Japan uses different options: the first choice is the fasciocutaneous rotation flap of the gluteus, and the second option, the fasciocutaneous flap of gluteus based on perforans, with a success rate of 79.2%.

In the treatment of trochanteric sores, surgical principles of trochanteric bone protuberance abrasion, excision of skin portions that are not intact in all its thickness, and pseudobursa removal are already a consensus, and, for the reconstruction, surgical options are: local skin and subcutaneous tissue flaps, muscular flaps, and musculocutaneous flaps⁽¹⁵⁾.

In the treatment of trochanteric sores, we used as first option the myocutaneous flap of the fascia lata tensor in V-Y (68%) and the second option was the double-helix (4%), with a success rate of 80%. The Medical Service of the University of California⁽⁹⁾ uses as first option the myocutaneous flap of the fascia lata tensor in V-Y and as second option the re-advancement of the tensor, with a success rate of 93%.

Complication rate on the treatment of ischiatic sores was 50%. By comparing it to data from the University of California⁽⁹⁾ this rate was 42%. The complication rate on sacral sores treatment was 64%. By comparing our data to those of the University of California, this rate was 20%.

The selection of a given kind of flap for covering pressure sores is of crucial importance to success⁽⁹⁾. Despite the fact that USP Medical School and the University of California achieved higher success rates than those for sores treated in Japan⁽¹⁹⁾, prefer the use of myocutaneous flaps for repair instead of fasciocutaneous flaps, a comparison among the groups is difficult. According to data from a study conducted in Japan, recurrence rates observed on the treatment of pressure sores were much higher in groups using myocutaneous flaps (in ischiatic sores, for example, from the 48.9% of recurrence rate, 27.8% were in fasciocutaneous flap group and 64% in groups treated with myocutaneous or muscular flaps). In the study conducted by USP Medical School no significant experience was shown with the use of fasciocutaneous flaps for reconstruction of pressure sores, and their use in those sores cannot be evaluated by a success or recurrence rate.

Complication rate in the treatment of pressure sores in this study was higher if compared to those observed at the University of California. 50% for ischiatic sores, 84% for trochanteric sores, and 64% for sacral sores at the Medical School, University of São Paulo, while at the University of California complication rates were 42% for ischiatic sores, 15% for trochanteric sores, and 20% for sacral sores⁽⁹⁾.

Sore site	Surgical Treatment	Number of Cases
Trochanter	Fascia Lata Tensor flap	7
Sacrum	Skin graft	2
	Surround skin flap	1
	Fascia Lata Tensor flap	1
	Gluteus Maximus flap	1
Ischium	Fasciocutaneous flap	1
Total		13 (21.7%)

Table 5: Partial Losses of Surgical Treatment
(Losses smaller than 30%)

Sore site	Surgical Treatment	Number of Cases
Trochanter	Fascia Lata Tensor flap	1
Ischium	Femoral biceps flap	1
Total		2 (3.3%)

Table 6: Total losses of Surgical Treatment
(Losses bigger than 30%)

Sore site	Surgical Treatment	Number of Cases
Trochanter	Fascia Lata Tensor flap	1
Ischium	Border-border closing	1
Sacrum	Surround skin flap	1
	Gluteus Maximus flap	3
Total		6 (10%)

Table 7: Minor Dehiscences
(Dehiscences smaller than 3 centimeters)

Sore site	Surgical Treatment	Number of Cases
None	-	0

Table 8: Major Dehiscences
(Dehiscences bigger than 3 centimeters)

Sore Site	Hematoma	Seroma	Infection	Malign Deg.
Sacrum	2	1	4	0
Ischium	0	0	3	0
Trochanter	3	1	8	0
Other	0	0	0	0
Total	5 (8.3%)	2 (3.3%)	15 (25%)	0

Table 9: Overall Complications (post-operative)

	Overall Complications Rate	Success Rate
Ischiatic	6 (50.0%)	8 (66.6%)
Sacral	16 (64.0%)	21 (84.0%)
Trochanteric	21 (84.0%)	20 (80.0%)

Table 10: Overall Complications and Success Rates

This higher rate can be related to the deficit of support infrastructure in the treatment of pressure sores and to the number and training level of nurses. While in the United States of America the post-operative care is given to patients in air fluid beds, at the Medical School of the University of São Paulo, patients are lodged in ordinary beds, being adapted by the use of "egg shell" mattresses.

Infection rate is also much higher when comparing data gathered from the University of California⁽⁹⁾. At Hospital das Clínicas (Medical School, University of São Paulo) the rate is 25%, while in the other service, is of 6.5%. If a ward gathers all patients with pressure sores, infection rates could raise, once infected pre-operative patients exist in the same room as early post-operative patients. Regarding chronic sores, treatment was achieved in 93.3% (42/45) of patients, while in the University of California⁽⁹⁾ this was achieved in 41% (115/280) of patients.

A ward counting on four beds for paraplegic patients with pressure sores cannot support a hypertrophic outpatient room with patients coming from all over the country, once the number of expert institutions for that end is very scarce in Brazil.

Concerning the hospitalization time, we observed an average period of 88 days. At the University of California⁽⁹⁾, we found an average period of 20 days.

The 1.7 pressure sore by patient average rate could exclusively explain the extended hospitalization time once a stand-by time of 3 weeks is required for the operated site to heal and for a new region to be addressed^(9,10). Associated to this fact, malnutrition, local conditions of the pressure sore due to lack of care and basic diseases presented by those patients, a longer preparation time (nutritional, sore debridement, compensation of basic diseases) becomes necessary, thus extending the hospitalization time.

The 25% recurrence rate reported in this series is lower if compared to Japan⁽¹⁹⁾, and may be related to a shorter patients' post-operative follow-up time.

It is important to report that in the United States of America, hospi-

talization average time in a reference service is 12 – 20 days and the expenses reach US\$ 21,675/ sore, while in Brazil, this burden would probably be much higher.

CONCLUSIONS

After evaluating 45 patients (77 sores) within the period of February 1st 1997 to March 1st 1999 through a prospective study, we concluded that:

A- From the epidemiological point of view:

- male: female ratio of 4:1
- site: 32.47% sacral sores, 32.47% trochanteric sores, 15.58% ischiatic sores
- age: ranging from 17 to 64 years old, with an average of 34.78 years old (young adults)
- average number of sores/ patient: 1.71
- risk factors: 100% spinal cord injuries, predominance of paraplegics (77.7%), with the majority being due to gun shots (60%)
- prevalence of chronic sores (93.3%)
- most of the sores with Class IV lesions (67.53%) (classification according to the National Center of Spinal Cord Injuries Data)
- larger size in trochanteric sores in their largest diameter (average 9.5 cm).

B- Regarding treatment:

- Prevalence of surgical treatment: 77.92%
- Most of surgical procedures performed with the use of myocutaneous flaps (45%)
- Treatment success rates of trochanteric sores (80%), and sacral sores (84%) were higher than ischiatic sores (66,6%)
- Sores recurrence rate was 25%

C- Regarding complications:

- Complications rate varied according to site: 50% for ischiatic sores, 84% for trochanteric sores, and 64% for sacral sores.

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