

Research Article

Prevalence, Risk Factors and Surgical Management of Pressure Sores: An 11-Year Study in a Tunisian University Hospital

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Abstract

Pressure sores are skin lesions caused by prolonged pressure, often against bony prominences or due to unrelieved contact with medical devices. A retrospective study has been conducted over an 11-year period at the Habib Bourguiba University Hospital in Sfax and included 54 patients who underwent surgical treatment for pressure sores. The median patient age was 54 years, with a male predominance. The most common comorbidities within the patients' medical history were hypertension and diabetes. The majority of sores were caused by neurological disorders (42.9%) and trauma (33.3%).

Signs of infection were present in 43.3% of cases. The average size of the pressure sores was of 4 ± 1.2 cm. The primary treatment consisted of cleansing with a saline solution (97.3%), followed by antiseptic irrigation with povidone-iodine in some cases (36.7%). Surgical management included debridement and coverage with either an autoplasty or local flaps (57%). Postoperative complications included wound dehiscence and acute loss of blood requiring transfusion; however, no pathological scarring was observed and only one case of recurrence was noted.

Complications were significantly associated with diabetes, prolonged immobilization and initially necrotic sores. This study highlights the critical role of preventive measures and hygiene in the effective management of pressure sores.

Keywords: Pressure Sores; Surgical Management; Risk Factors; Complications

Introduction

Pressure sores represent a major public health issue, significantly affecting the patients' quality of life, reducing life expectancy and increasing patient reliance on healthcare services [1,2]. Defined as skin injuries resulting from prolonged pressure and/or shear, the classification of pressure sores has been evolving since 1989, with revisions by ANAES in 2001 and the NPUAP

in 2016 [3-5]. There are three main etiological categories depending on the underlying cause: traumatic, neurological and multifactorial [6].

Management of pressure sores involves a multidisciplinary approach involving various healthcare professionals [1]. Reconstructive surgery is often necessary, particularly for sores related to a traumatic or a neurological origin and especially in patients with a hope of a sufficient functional recovery [7]. Despite their prevalence, pressure sores remain underdiagnosed and poorly managed in countries such as Tunisia, where the impact of the condition is frequently underestimated [10]. The aim of this retrospective study is to explore the epidemiological profile and the surgical management strategies for pressure sores at Habib Bourguiba University Hospital in Sfax.

Patients and Methodology

This retrospective descriptive study was conducted over an 11-year period (between 2012 and 2022) in the Department of Plastic Surgery at Habib Bourguiba University Hospital in Sfax, Tunisia. It included all hospitalized patients with one or more pressure sores excluding those who were not operated on or had incomplete medical records.

Data were extracted from patient files including socio-demographic variables (age, sex, geographic origin, socioeconomic status), clinical data (medical history, general condition, duration of bedridden status, etiology and stage of ulcer, signs of infection), laboratory results (CBC, albumin levels, CRP, electrolyte panel) and imaging findings (evidence of osteitis).

The management strategy was assessed based on preoperative care, surgical techniques employed (debridement, flap type, number of operative stages), postoperative complications (necrosis, infection, recurrence) and the quality of the wound healing. The evaluation tools included the WHO BMI classification for assessing overweight and obesity, the NPUAP staging system for pressure sores and the Karnofsky Performance Scale to assess patient autonomy.

Statistical analysis was performed using SPSS version 26. For descriptive analysis, rates were used to express qualitative variables and means \pm standard deviation were used to express quantitative variables, after testing for normality using the Chi-squared test. The analytical study identified the risk factors for postoperative complications through the use of the Chi-square or Fisher's exact test in the comparison of qualitative variables and the Student's *t*-test or Mann-Whitney test for quantitative variables. A *p*-value < 0.05 was considered a threshold for statistical significance.

Results

Over an 11-year period (2012-2022), 54 patients were managed for pressure sores out of a total of 4,105 department admissions, corresponding to a prevalence of 1.3% and an average annual rate of 5 cases. The study included 21 patients who developed a total of 30 pressure sores. The patient population was predominantly male, with a male-to-female ratio of 4.25. The mean age was 54.7 ± 23.8 years with a range from 15 to 92 years. Patients under 20 years of age accounted for 9.5%, while all the patients over 40 years old were male. 52.4% of the patients originated from rural areas and 61.9% had a medium socioeconomic status, while 38.1% were of low socioeconomic status.

Tobacco use was reported in 52.4% of patients, while no cases of alcohol use were recorded. The most common comorbidities noted in the medical history were hypertension in association with diabetes (23.8%), whereas 4.8% of the patients having diabetes alone. Other medical conditions were reported in 33.3% of patients.

The majority of the pressure sores were associated with neurological causes accounting for 42.9% of the cases, followed by accidental pressure sores (33.3%), then multifactorial etiologies (23.8%). The duration of immobilization prior to the revelation of the ulcer ranged from 3 to 12 months in 42.9% of patients, whereas 19% had been bedridden for over one year. Preventive measures were implemented in 61.9% of cases, primarily through regular repositioning (52.4%), while 38.1% had taken no preventive actions.

Nutritional status assessment showed that 33.3% of patients were underweight and that 9.5% were obese. General condition was good in 71.4% of patients, whereas 28.6% had decompensated an underlying condition. The Karnofsky Performance Score was below 50 in 66.7% of patients. Amongst the specific conditions noted, spinal cord injuries were found in 19% of the cases and a history of stroke in 14.3%. Urinary catheterization was observed in 28.6% of patients, resulting in urinary tract infections in 4.8% of cases.

The most common anatomical sites for pressure sores were ischial (23.3%), heel (20%) and sacral (16.7%) regions, followed by Trochanteric and occipital sores which accounted each for 13.3% of the sites, while knee and leg sores were less frequent (6.7% each). The mean ulcer size was 4 ± 1.2 cm, with sacral and trochanteric sores reaching up to 6 cm in diameter. Clinically, sores presented with ulceration (43.3%), necrosis (40%) or an association of both (10%). According to the NPUAP classification, 46.7% were stage III, 36.6% stage IV and 16.7% were unstageable due to necrosis.

Signs of infection were commonly found within 43.3% of sores presenting as an erythema, foul odor or purulent discharge. Fever was observed in 40% of patients and 86.7% reported localized pain.

Comorbidity management was implemented in 42.9% of cases. All patients were subject to wound care following guided healing strategies, with favorable outcomes in 90% of cases. Ulcer cleansing was performed regularly primarily using normal saline (59.9%) or povidone-iodine (36.7%). Dressings primarily included dry gauze (50%) and paraffin gauze (46.7%).

Surgical management included debridement in all cases, with 76.7% of sores requiring flap coverage. Procedures were conducted in one or two operative stages, using local flaps in 56.5% of cases and locoregional flaps in the other 43.5%. Flap types included superior gluteal flaps (17.4%) and medial plantar flaps (13%).

The most frequent postoperative complications were wound dehiscence and acute anemia requiring transfusion (16.7% each), with early complications occurring in 47% of cases. Recurrence was observed in 3.3% of patients. No pathological scars were noted.

Regarding healing outcomes, 70% of sores showed good wound healing, 26.7% moderate healing and 3.3% poor healing. No statistically significant association was found between postoperative complications and sociodemographic variables (age, sex, origin, socioeconomic status, lifestyle habits). However, diabetes and other comorbidities found in the medical history were significantly associated with postoperative complications ($p = 0.006$). A bedridden duration exceeding 12 months was also associated with a higher risk of complications ($p = 0.021$), as was the presence of necrosis ($p = 0.024$). Whereas other ulcer characteristics, such as location or NPUAP stage, did not show a significant correlation with an increased post-operative complication risk.

Finally, while surgical management overall was not significantly associated with postoperative complications, some procedures including flap coverage were more frequently performed in patients who experienced such complications.

Discussion

Pressure sores are the third most costly medical condition after cancer and cardiovascular diseases, resulting in a high mortality rate with approximately 60,000 deaths annually [2]. They are associated with numerous complications, including pain, reduced autonomy, increased infection risk, additional surgical interventions and increased costs for patients, their families and the healthcare system [7-9]. Complications may also include depression, osteomyelitis and occasionally death [10,11].

In Tunisia, despite the medical and economic significance of this pathology, no specific studies were conducted on the epidemiology and surgical management of pressure sores. In our department, 54 patients were treated for pressure sores, with a prevalence of 1.3%, which is lower than that reported in the literature (Table 1). This difference may be attributed to the departments involved, patient selection bias and the socio-demographic profiles of the countries studied.

The median age in this study was 54.7 years, with 19% of patients over 80 years old (Table 2). An increased prevalence of pressure sores in the elderly has been reported in previous studies, especially in those over 75, due to more fragile skin, which increases the risk of ulcer development [13,27].

Compared to other international studies, our study shows a lower prevalence than other countries, such as China (3,38%), Norway (14,9%) and the United States (9,3%) [17,19,23]. These discrepancies are likely due to methodological differences and the quality of care in each country.

Characteristics	Result
Pressure sores Prevalence	1,3 % among 4105 admissions (54 patients)
Annual Incidence	An average of 5 cases per year
Number of Patients	21 patients with 30 pressure sores
Sex Distribution	Predominantly male (sex ratio 4,25)
Mean age	54,7 ± 23,8 years (range : 15-92 years)
Geographic Origin	52,4 % from rural areas
Socioeconomic Status	61,9 % with a medium socioeconomic status 38,1 % with a low socioeconomic status
Smoking	52,4% of patients were smokers
Medical history	23,8 % had an association of hypertension and diabetes 4,8 % diabetes only 33,3 % other pathologies 38,1 % with no medical history
Duration of bedridden status	3-12 months in 42,9% of the cases More than 1 year in 19% of the cases
Preventive measures	61,9% implemented preventive measures (primarily regular position changes) 38,1% took none
Nutritional Status	33,3% were underweight 9,5% were obese
General Status	71,4 % has a good general status, 28,6 % had a decompensated underlying condition
Karnofsky Performance Score	< 50 in 66,7 % of patients
Specific conditions	Found in 71,4 % of patients (including spinal cord injury, a history of a stroke)
Urinary catheterization	Found in 28,6 % of patients (an associated urinary tract infection in 4,8% of cases)
Pressure sores' anatomical sites	Ischial (23,3 %), Heels (20 %), Sacral (16,7 %), Trochanteric and occipital (13,3 % each)
Pressure Sore Size	An average of 4 ± 1,2 cm, (with sacral and trochanteric locations reaching 6 cm)
Clinical aspect	Ulceration (43,3 %), Necrosis (40 %), An association of both (10 %)

Pressure sore staging (NPUAP)	Stage III (46,7%), Stage IV (36,6%), Unstageable (16,7%)
Pressure sores infection	Signs of infection in 43,3% (erythema, <u>foul</u> odor, pus discharge), Fever (40%), Localized pain (86,7%)
Surgical management	Surgical debridement for all the patients, Flap coverage (76,7%) (local flaps 56,5 %, loco-regional 43,5 %)
Post-operative complications	Wound dehiscence an acute anemia (16,7 % each), Early complications (47 %), Recurrence (3,3 %)
Wound healing	Good (70 %), Medium (26,7 %), Poor (3,3 %)
<u>Predictive factors of complications</u>	Diabetes and other comorbidities Prolonged bedridden status (> 12 months) <u>were</u> significantly correlated with early complications (p<0,05)
Management of complications	Surgical management (flaps) did not show a significant impact in reducing complications, Flaps were mostly used in patients who presented complications

Table 1: Summary of descriptive results.

Variable	Detail	p	Statistical Result
Medical history	Diabetes and other comorbidities	0.006	Significant correlation with postoperative complications
Duration of bedridden status	Bedridden > 12 months	0.021	Significant correlation with postoperative complications
Presence of necrosis	Necrosis present on the pressure Sore	0.024	Significant correlation with postoperative complications
General assessment (Nutritional status)	Underweight, normal, etc.	0.379	No significant correlation with postoperative complications
General assessment (Overall condition)	Good general condition, decompensation	0.674	No significant correlation with postoperative complications
Karnofsky index	< 50 or ≥ 50	0.715	No significant correlation with postoperative complications
Specific underlying condition	Presence or absence	0.713	No significant correlation with postoperative complications
Pressure sore location	Sacral, heel, ischial, etc.	0.838	No significant correlation with postoperative complications
Pressure Sore stage (NPUAP)	Stage III, IV, or unstageable	0.219	No significant correlation with postoperative complications
Surgical management	Local antibiotics, directed healing, flap coverage	0.195–0.239	No significant correlation with postoperative complications

Table 2: Summary of statistical results.

In this study, the female-to-male sex ratio was 0,23 (81% men, 19% women), which slightly differs from findings in other studies [23,26]. Pressure sores are mainly caused by prolonged pressure on soft tissues, causing local hypoxia which results in tissue damage. External factors such as excessive pressure, maceration, friction and high temperatures, along with intrinsic factors like prolonged immobility, malnutrition, incontinence and neurological disorders, increase the risk of developing pressure Sores [27].

In our study, 38% of patients had not implemented any preventive measures before hospitalization, highlighting a lack of prevention.

The most common ulcer anatomical locations found in our study were ischial (23.3%), heel (20%) and sacral (16.7%) which differs from the usual sites reported in other studies, where pressure sores are primarily located on the sacrum, ischial tuberosity or greater trochanter (8, 16). Depending on patient positioning, Pressure sores may develop in different anatomical sites, with the most affected areas being the occiput, the scapulae, the spine, the sacral region and heels in the supine position, whereas the trochanteric region is the most affected in the lateral decubitus position [31].

The NPUAP classification used in our study showed that 46.7% of sores were stage III and 36.6% were stage IV, which are advanced stages usually requiring surgical intervention. Pressure sore healing is subject to a complex biological process negatively influenced by factors such as diabetes, smoking, malnutrition and infection [35]. In this study, 28.6% of patients were diabetic, 52.4% were smokers and 43.3% showed signs of superinfection, increasing their vulnerability to advanced-stage Pressure Sores.

Complications primarily included local infections (43.3% of cases), often due to inadequate initial management. Medium-term complications such as depression and decompensation of underlying conditions can jeopardize further surgical management [35]. Long-term consequences may include functional impairment and, in rare cases, transformation into squamous cell carcinoma [35].

Directed wound healing remains the preferred method, requiring nutritional management and infection prevention to avoid recurrence [42]. Management of pressure sores often involves surgical debridement followed by local flap procedures using musculocutaneous flaps for coverage [42-49].

Postoperatively, an air mattress is recommended. However, no postoperative rehabilitation was provided in this study due to the patients' low socioeconomic status.

Postoperative complications, such as wound dehiscence, were present in 47% of cases and recurrence was noted after 12 months [50-65].

Conclusion

Assessing the risk of developing pressure sores is essential in order to implement personalized preventive measures. Several tools, such as the Norton and Braden scales, are used to assess risk. However, the Norton scale does not account for nutritional status, a key factor in pressure sore development risk. Preventive measures include daily skin examination, proper skin hydration, management of incontinence and nutritional monitoring to prevent malnutrition.

Finally, the study has limitations, including incomplete data collection and its retrospective nature, which affect the reliability of the findings and their generalizability.

Conflict of Interest

The authors declare that there is no conflict of interest.

Free and Informed Consent Term

The patient authorized the publication of the article.

Availability of Data and Materials

Data is custodied by the author and can be released on trust.

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