Treatment of pressure ulcer-related pelvic osteomyelitis

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Abstract

Introduction: The treatment of chronic osteomyelitis associated with ulcer around the pelvis is complex and multidisciplinary. Antibiotic treatment aimed at more than one microorganism plus surgery might decrease infection recurrence. The aim of this study was to analyze results in patients with chronic osteomyelitis associated with pressure ulcer showing extensive coverage defects around the pelvis and treated with wound bed debridement and flaps for coverage defects.

Materials and Methods: We carried out a descriptive, retrospective study based on data from medical histories from patients who required surgical coverage for pressure ulcers, between October 2010 and February 2017. Patients were treated with a two-time surgical procedure: debridement and then coverage flap for the remaining defect.

Results: We treated 27 pressure ulcers (9 sacral, 13 ischiatic and 5 trochanteric ulcers) in 15 patients (44.9 years old on average [range= 22-81]). Three ulcers developed just one germ, whereas in the remaining cases, cultures were polymicrobial. We administered i.v. antibiotics during minimal 4-6 weeks. Initial ESR and ultrasensitive PCR were 72 mm/h and 55 mg/l respectively, and they decreased to 49 mm/h and 20 mg/l respectively 3 months later.

Conclusions: Our protocol shortens treatment because we do not wait until antibiotic treatment is done to carry out surgical treatment with flap. We believe that the immediate coverage of the soft tissues defect keeps microorganisms at bay. This way we have got good results with low recurrence rates as compared with results in other series.

Key words: Osteomyelitis; pelvis; pressure ulcers.
Level of evidence: IV

Tratamiento de la osteomielitis asociada a úlceras alrededor de la pelvis

Resumen

Introducción: El tratamiento de la osteomielitis crónica asociada a úlceras alrededor de la pelvis es complejo y multidisciplinario. Un tratamiento antibiótico, dirigido a más de un microorganismo, sumado a la cirugía permitiría disminuir la recurrencia de la infección. El objetivo de este estudio fue analizar los resultados en pacientes con osteomielitis crónica asociada a úlceras por presión, con gran defecto de cobertura alrededor de la pelvis, tratados con desbridamiento del lecho y un colgajo para el defecto de cobertura.

Materiales y Métodos: Se realizó un estudio descriptivo, retrospectivo, basado en los datos de las historias clínicas de pacientes que requirieron cobertura quirúrgica de úlceras por presión, entre octubre de 2010 y febrero de 2017. Los pacientes

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fueron tratados con un procedimiento en dos tiempos quirúrgicos: desbridamiento y luego colgajo de cobertura del defecto remanente.
Resultados: Se trataron 27 úlceras (9 sacras, 13 isquiáticas y 5 trocantéricas) en 15 pacientes (edad promedio 44. 9 años [rango 22-81]). Tres úlceras desarrollaron un solo germen, en el resto, los cultivos fueron polimicrobianos. Se administraron antibióticos intravenosos durante un mínimo de 4-6 semanas. Los valores iniciales de eritrosedimentación y proteína C reactiva ultrasensible fueron 72 mm/h y 55 mg/l, respectivamente, y disminuyeron a 49 mm/h y 20 mg/l, respectivamente, a los 3 meses.
Conclusiones: Nuestro protocolo acorta los tiempos de tratamiento, ya que no se espera a terminar la antibioticoterapia para realizar el colgajo. Consideramos que la cobertura inmediata del defecto de partes blandas permite controlar el acceso de nuevos microorganismos a la región afectada. Así hemos obtenido buenos resultados con una baja tasa de recidiva comparada con la de otras series.

Palabras clave: Osteomielitis; pelvis; úlceras por presión.
Nivel de Evidencia: IV

Introduction

Osteomyelitis is a severe, potentially lethal condition[1] with different kinds of onsets—it can be acute or chronic, and chronic osteomyelitis can persist months or years with low degree of inflammation.[2] In general, chronic osteomyelitis affects patients with neurological disorders which alter motor and sensitive functions, what leads the patient to prostration and lack of pain as main alert for injury. Therefore, they can suffer extensive ulcers which, eventually, can involve underlying bone tissues, and one third of the patients will develop osteomyelitis.[3]

The treatment of chronic osteomyelitis associated with extensive ulcers in complex and multidisciplinary. The combination of an antibiotic treatment usually aimed at more than one microorganism plus surgical treatment will result in a decrease in infection recurrence.

The treatment available for these types of lesions is usually the extensive debridement described by Cannon et al. in 1950, suitable to the wound bed;[4] however, the absence of soft tissues coverage exposes the area to likely new contamination.

Under such circumstances, the combination of antibiotics and an orthoplastic surgical treatment would result in best benefits to alleviate the affection.[5,6]

All in all, the aim of our study was to assess results in wound bed debridement combined with immediate flap to cover defects in patients with chronic osteomyelitis associated with pressure ulcers and extensive coverage defects around the pelvis.

Materials and Methods

We carried out a descriptive, retrospective study based on data from the revision of medical histories and the recent telephonic contact with whose patients who required surgical coverage in pressure ulcers between October 2010 and February 2017. Fifteen patients with 27 decubitus ulcers around their pelvis were subject to surgery.

Patients' bed-staying had different causes and had in common lack in sensitivity or mobility in lying-down areas. In all cases injuries involved soft tissues and underlying bone tissues, and affected more than one anatomic region.

Inclusion criteria were: >18 years old patients with more-than-6-month-history of 4-degree pressure ulcer with bone exposure and compression on the lesion, and who were able to keep imposed postoperative bed-staying.

Exclusion criteria were: patients with ulcer without bone exposure and who, due to different reasons, did not understand or were unable to keep postoperative bed-staying.

The main etiology of the lesion was spinal cord injury in six patients (4 due to car crash, one case of spinal cord ischemia due to vascular disorders, and one sequelae of an anesthetic procedure). All the patients were unable to stay in their two feet, and required sitting position.

In five cases, in etiology there was a congenital spinal condition involved—myelomeningocele (a patient with low injury who was able to stay in their two feet with aid, and the remaining patients requiring sitting position).

In the latter four patients, the etiology of pressure ulcers was different: two patients were prostrated in the ICU for different reasons and in recovering process; they had been referred to our institution already with decubitus ulcers; the third patient had suffered Guillian-Barré disease in childhood, and as sequelae they showed lack in sensitivity in their pelvis and both lower limbs; and the fourth patient was in deteriorated condition with amyotrophic lateral sclerosis, unable to keep independence but with self-understanding and able to keep bed-staying.

Patients were treated by a protocol of a two-time procedure. The first surgical time consisted of wound exploration, resection of ulcer tissues, resection of affected tissues, sampling of soft tissues and bone for cultivation and histological analysis, and subsequent wound monitoring

with a system of continuous negative aspiration transitorily up to the second surgical procedure during the same hospital stay.

After the first surgical time, patients are given i.v. broad-spectrum antibiotics until identifying the underlying microorganism.

The second surgical time was carried out within the one week following the first procedure, and consisted of defect and underlying bone coverage by dermolipid, muscle or myocutaneous flap on the grounds of location, the shape of the defect[5,6] and other consideration such as the walking status of the patient or their requiring sitting position, and muscle functionality to use as coverage method thus decreasing the likely affection while walking.

After the coverage procedure, the patient was made to stay in bed on the grounds of the compromised area. Patients were discharged on average 10th post-coverage day with indication of i.v. antibiotic treatment as determined by antibiogram in the sample taken at the time of the first procedure.

We carried out clinic-infectious checkups of flaps 2 and 4 weeks after the surgery, and then on a monthly basis together with the muscle infectious diseases team until proper flap-host adjustment.

From an infectious point of view and according to current protocols, we administered i.v. antibiotic treatment during 4-6 weeks to then change for a p.o. antibiotic treatment during other 4-6 weeks on the grounds of patients' clinical and lab results. ESR and ultrasensitive RCP were the main parameters to estimate the response of infection to antibiotic treatment.

Healing was evaluated 30 days later by weight-bearing on the flap for limited periods and bed frequent position changes, allowing patients longer weight-bearing on such areas in a sequential way.

Once patients restarted their usual rhythm, they were advised local daily checkups and they were trained in personal care.

The last contact with patients was by phone to determine the presence of local pressure ulcer recurrence.

Results

We included 15 patients (2 females) averaging 44.9 years old (ranging from 22 to 81).

We treated 27 pressure ulcers:

- 9 sacral ulcers, with dermolipid flaps. Four were small injuries, we used upper-pedicled dermolipid flaps and, in larger defects, bi-pedicled lumbar dermolipid flaps (Figures 1-3). One of these patients showed recurrence two years later and they were treated with advancement from the same flap.

- 13 ischiatic ulcers, managed differently on the grounds of the size of the lesions and patients' characteristics. As first option we used V-Y lower-pedicled myocutaneous flaps in four patients (Figures 4-6); there was one case of recurrence one year later. When the skin adjacent to the gluteal muscle was compromised or the patient was able to walk, we decided to change strategies and we used muscle flaps (6 cases from the dorsal aspect of the thigh and 2, from the lateral thigh aspect). In one of these lat-

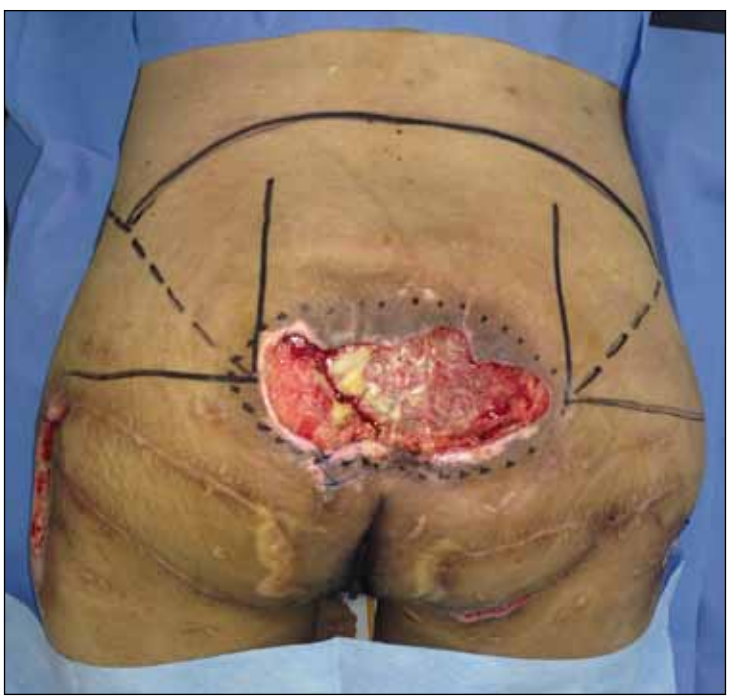

Figure 1. Postoperative clinical picture in sacral ulcer.

Figure 2. Immediate postoperative results with bi-pedicled dermolipid flap for sacral ulcer coverage.

Figure 3. Long-term results in the treatment of sacral ulcer.

ter patients, we treated a recurrence from a previous flap. Lastly, in a patient with an ischiatic pressure ulcer and a homolateral trochanteric pressure ulcer we used a myocutaneous flap from their fascia latae muscle to get coverage in both injuries.

- 5 trochanteric ulcers, with myocuteneous flap from their fascia latae muscle. Depending on the shape of the lesion, we used V-Y flaps or 90º-rotating flaps, with no recurrence.

Only three of the 27 pressure ulcers that we treated developed just one germ— methicillin-resistant *Staphylococcus aureus* and *Klebsiella pneumoniae;* the rest of the cultures were of multimicrobe profile. The most frequently isolated germs were: *Proteus mirabilis* (8/27), *Echerichia coli* (8/27), *Enterococcus faecalis* (7/27), and *Pseudomonas aeruginosa* (5/27). Other microbes less frequently found were: *Streptococcus agalactiae* (4), methicillin-sensitive *Staphylococcus aureus* (3), *Acinetobacter baumannii* (3), *Klebsiella pneumoniae* (2), *Enterococcus cloacae* (1), *Staphylococcus lugdunensis* (1), *Staphylococcus haemo-lyticus* (1), *Corynebacterium striatum* (1),

Figure 4. Preoperative clinical picture of ischiatic ulcer.

Figure 5. Immediate postoperative results with myocutaneous gluteal flap for ischatic ulcer coverage.

Figure 6. Long-term results in the treatment of ischiatic ulcer.

and *Enterococcus avium* (1). Gram-negative microorganisms responded to i.v. imipenem, ciprofloxacin or ertapenem, whereas the treatment for gram-positive germs consisted mainly of vancomycin, ceftriaxone, imipenem and ampicillin/sulbactam. Patients received i.v. antibiotic treatment during minimal 4-6 weeks, on the grounds of infectious parameters (ESR and RCP) and results in the surgical area.

Before the surgical procedure, ESR results were variable, between 29 and 120 mm/h (72 mm/h on average) and they decreased after a three-month treatment to 7-89 mm/h (49 mm/h on average).

The levels of ultrasensitive RCP before the surgery were 9-142 mg/l (55 mg/l on average), and they decreased to 0-59 mg/l (20 mg/l on average) three months later.

All in all, there were two pressure ulcer recurrences: a sacral ulcer 7 months after the initial procedure and an ischiatic ulcer 4 months later; both of them were re-treated with local coverage with no recurrence up to now. We considered that recurrence with new coverage defects and bone tissues exposure was directly related to patients' carelessness, and not to reactivation of local infection.

Average follow-up was 21 months (ranging from 2 to 37 months).

Discussion

When it comes to the management of decubitus ulcers, there have been numerous reports on treatment methods such as debridement, negative aspiration systems, skin free grafts and skin flaps, among others.[7,8]

At the end of the 20th century, Mathes, Nahai and Pontén paved the way to success with the use of myocutaneous and fascioctuaneous flaps, respectively, which today are widely used for the surgical treatment of pressure ulcers.[9-11] According to specialized bibliography, over the past 50 years, ulcer recurrence rates after such flaps have oscillated between 3% and 82%.[12] In a series of 101 patients, Larson et al.,[13] reported recurrence rates of 16.8% in 179 ulcers (26.8% of sacral ulcers, 49.7% of ischiatic ulcers, and 19% of trochanteric ulcers). On the other hand, Grassetti et al.[14] treated 143 patients with sacral ulcers (42.7%), ischiatic ulcers (46.2%) and trochanteric ulcers (11.2%). After a two-year follow-up, recurrence rates were of 22.4%. Josvay et al.,[15] in their series of 58 patients with 73 treated pressure ulcers (27.4% of sacral ulcers, 10.9% of trochanteric ulcers, and 61.6% of ischiatic ulcers), reported recurrence rates of 5.48% (4 cases).

Our patients were treated according to current protocols by a two-time surgical treatment, plus i.v. antibiotic treatment adequate to results in osteomyelitis cultures. We got good postoperative results in the 27 ulcers, with recurrence rates of 7.5%, what can be compared to the other publications on the subject.

With respect to the treatment of chronic osteomyelitis simultaneous to decubitus ulcer, Rishikeson et al.[16] studied 20 patients with pelvic chronic osteomyelitis; nine cases (45%) developed just one microorganism, and 11 (55%) were polymicrobial infections. The isolated germs were: methicillin-sensitive *Staphylococcus aureus* (40%), negative-coagulase *Staphylococcus* (30%), methicillin-resistant *Staphylococcus aureus* (20%), *Enterobacter* (25%), *Pseudomonas* (25%) and *E. coli* (35%); there were

only two patients with *Proteus* and *Candida albicans* and, contrarily to our series, *Proteus mirabilis* was hardly frequent.

In our series, the germs more frequently isolated were *Proteus mirabilis*, *Enterococcus faecalis, Esche-richia coli* and *Pseudomonas aeruginosa*. Only three ulcers (11.1%) developed mono-cultures; the remaining 24 ulcers (88.9%) developed multibacterial cultures. Gram-negative microorganisms responded to i.v. treatment with imipenem, ciprofloxacin or ertapenem, whereas most Gram-positive germs responded to ceftriaxone, vancomycin, imipenem and ampicillin/sulbactam.

In the Phani et al.'s study,[17] 117 out of the 200 patients (51%) had osteomyelitis, and the isolated germs were: methicillin-resistant *Staphylococcus aureus* (37.3%), *Streptococcus* (19,17%) and *Pseudomonas* (20,18%). The authors report better results and fewer re-admittances in patients treated with antibiotic *and* surgery.

In our series, the coverage treatment of the soft tissues defect plus i.v. antibiotic treatment made ESR and RCP decrease in the first postoperative months. There were neither ulcer recurrence nor new decubitus ulcer, but for two cases who were re-treated applying the therapeutic protocol, with no recurrence up to now.

Conclusions

Our protocol shortens treatment in these cases because we do not wait until antibiotic treatment is done to carry out surgical treatment with flap; on the contrary, we believe that the immediate coverage of the soft tissues defect keeps new microorganisms at bay, what is essential for effective treatment in pelvic osteomyelitis and for the control of the local infection. We got good results with low recurrence rates as compared with results in other series.

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