Treatment of chronic osteomyelitis using the Papineau technique

M. Panda¹, N. Ntungila¹, M. Kalunda¹, M. Hinsenkamp²

¹ Service d'Orthopédie Traumatologie, Cliniques Universitaires de Kinshasa, B.P. 14902 Kinshasa 1, République Démocratique du Congo

² Service d'Orthopédie Traumatologie, Hôpital Erasme, Route de Lennik 808, B-1070 Brussels, Belgium

Accepted: 11 June 1996

Summary. *From 1984 to 1994, 41 cases of chronic osteomyelitis were treated in Kinshasa by the Papineau technique; 75.5% were men and 24.5% women. The mean age was 28 years (range: 7–77), and the average duration of the infection was 3 years (range: 1 month to 28 years). The aetiology was “trauma” in 53.5%, haematogenous in 44% and drepanocytosis in 2.5%. Infections of the femur and tibia each constituted 41.5% of the cases. Immobilisation was by external fixation in 44%, and by a cast in 39%. Wound healing was complete after an average of 3 months with spontaneous healing, and in 4.5 months after skin grafting. Control of the infection and bone healing were obtained in 89% after a period of 3–7 months. We discuss the Papineau technique and the modifications which were required in Kinshasa.*

Résumé. *De 1984 à 1994, 41 cas d'ostéomyélites chroniques (OMC) ont été traitées par la technique de Papineau dans les Hôpitaux de Kinshasa. La population étudiée est composée de 75,5% d'hommes et de 24,5% de femmes. La moyenne d'âge est de 28 ans (7–77 ans). La durée d'évolution de l'OMC est en moyenne de 3 ans (1 mois–28 ans). L'origine de la lésion est traumatique dans 53,5% des cas, hématogène dans 44% et dépranocytaire dans 2,5%. Le fémur et le tibia représentent chacun 41,5% des cas. Une contention associée a été réalisée dans 44% des cas par fixateur externe et par plâtre dans 39%. La cicatrisation cutanée est obtenue en moyenne en*

3 mois après épidermisation et en 4,5 mois après greffe cutanée. L'assèchement de l'infection et la consolidation osseuse sont obtenus dans 89% des cas après un délai de 3 à 7 mois en fonction de la localisation et de la gravité de la lésion. La discussion reprend les remarques et les attitudes spécifiques de traitement qui ont été imposées par l'environnement et les conditions de soins propres à la ville de Kinshasa.

Introduction

Between 1984 and 1994, 41 cases of chronic osteomyelitis were treated by means of the Papineau technique at the University Clinics and other hospitals of Kinshasa. The Papineau technique was performed in 3 main stages according to the description of Roy-Camille et al. [3]. The first stage, which involves excision of the infected tissue, is followed by “open-air” grafting using spongy bone. The third stage, when necessary, involves skin grafting [2]. In cases of osteitis or infected pseudarthrosis, this resulted in control of infection, bone consolidation and adequate skin cover.

Patients and methods

Patients

There were 41 cases of chronic osteomyelitis treated over a period of 10 years of which 31 were male (75.5%) and 10 female (24.5%). The average age was 28 years, the youngest being 7 years and the eldest 77 years; 78% were aged between 11 and 40 years (Table 1).

Reprint requests to: M. Panda, Service d'Orthopédie-Traumatologie, Cliniques Universitaires de Kinshasa, B. P. 14902 Kinshasa 1, République Démocratique du Congo

Table 1. Age distribution of patients

Age	Number of cases	%
1–10	1	2.5
11–20	12	29.2
21–30	15	36.6
31–40	5	12.1
41–50	5	12.1
51–60	1	2.5
61+	2	5
Total	41	100

Table 2. Location

Bone	Number of cases	%
Femur	17	41.5
Tibia	17	41.5
Foot	3	7.4
Radius	2	4.8
Ulna	1	2.4
Pubis	1	2.4
Total	41	100

Most of our patients had presented at least 3 months after the onset of infection; the earliest presentation was at 1 month and the latest at 28 years after the primary infection. Trauma was the most common cause, accounting for 22 cases (53.5%), 18 cases (44%) were haematogenous and one drepanocytosis. The most frequently affected bones were the femur and the tibia, accounting for 83% of cases (Table 2).

Clinically, chronic osteomyelitis presented with a sinus in 58.5%, with a chronically infected wound in 39% and pain in 2.5% of cases. Swelling of the limb was a constant finding, and the right side was predominantly affected (60%). Osteolysis was the most frequent radiological finding, and was apparent in 38 patients (92.6%). There was bone sclerosis in 26.8% and sequestrae in 51.2%. These 3 radiological signs were often present together. Blood tests were not very helpful; the average findings were haemoglobin 11.2 g/dl, WBC 6,750 per cumm, and ESR 39 mm/h.

Our laboratories were not of great help in culturing organisms or in determining their antibiotic sensitivity. In our series, cultures were only realized in 10 cases. *Staph. aureus* was isolated in 6 out of 10. Despite this prevalence, antibiotics were given empirically as the choice also depended on availability. Many patients (56%) received ampicillin, 22% chloramphenicol, 9.8% amoxycillin, 9.8% tetracyclin, and 2.4% received anti-tuberculous treatment. Antibiotics were given for 15 days after the sequestrectomy, and for a similar period after bone grafting.

Technique

We used the technique described by Roy-Camille [3], modified slightly by using multiple drill holes to facilitate really adequate sequestrectomy and saucerisation. The cavity was then thoroughly cleaned with Dakin's solution and normal saline. The dry cavity was packed with vaseline gauze impregnated with 1% framycetine (Sofratulle), and covered with a dry dressing applied in slight compression. The area was immobilised either with a Hoffmann external fixator, or a plaster

Table 3. Time between excision and bone graft

Delay (days)	Number of cases	%
1–10	1	2.5
11–20	17	41.5
21–30	12	29.3
31–40	7	17
40+	4	9.7
Total	41	100

Average delay: 24 days

Table 4. Sites and association of graft donor sites

Sites	No. of patients	No. of sites
Upper tibia	18	18
Iliac crest	4	4
Condyles of femur	1	1
Upper tibia + iliac crest	8	16
Upper tibia + condyles of femur	4	8
Upper tibia + iliac crest + condyles of femur	1	3
Upper tibia + iliac crest + greater trochanter	1	3
Total	37	53

cast. The wound was inspected after 12 days, 7 days later than advised by various authors [1–5]. However, if the dressing became very soiled, the external portion was changed without disturbing the vaseline gauze pack. When this was eventually removed there was usually adequate fresh bleeding and the bone surface was well covered with granulation tissue. This was then cleaned with Dakin's solution and normal saline, and a similar occlusive dressing was applied. We found that we were able to proceed to the second stage of bone grafting within the next 10 days. The donor site was primarily closed over a suction drain, the granulating cavity was cleaned again and then completely filled with fragments of cancellous bone; it was then covered with 2 layers of impregnated vaseline gauze and a further occlusive dressing.

Daily “drip” irrigations of the grafts were started 5 days later, using 1 litre of saline 2 h per day, and this was continued until the grafts were incorporated within the granulation tissue.

Skin cover was achieved either by spontaneous healing, or by a third stage of skin grafting. When a considerable amount of bone had been removed, radiography was necessary to decide when immobilisation could be discarded and when the limb might be allowed to bear weight.

Results

Immobilisation was provided by plaster in 16 cases (39%), and by a Hoffmann external fixator in 18 (44%). The remaining 7 patients were left free. In 70% of patients, the second operation was performed after 11–30 days, the average being 24 days (Table 3). Grafts were taken from the tibia in 32, the iliac crest in 14, the femoral condyles in 6, and from the greater trochanter in 1 patient.

Table 5. Appearance of granulation tissue

Delay (days)	Number of cases	%
1–10	3	8.5
11–20	14	40
21–30	18	51.5
Total	35	100

This information was not available in 4 cases. Sometimes bone was taken simultaneously from more than 1 site (Table 4). The average quantity of saline used for irrigation was 56 litres, but in 3 children wound healing occurred without irrigation. Table 5 shows the delay of appearance of the granulation tissue. A skin graft was required in 29 patients in order to achieve healing in an average of 4.5 months. Spontaneous healing occurred on average in 3 months.

Consolidation of bone, which is the final result, was judged radiologically by the presence of new bone formation (Table 6), and clinically by a return to weight-bearing without local support.

Complications

Two patients required repeat sequestrectomies, 2 required repeat bone grafts and 1 required a repeat skin graft. There were 5 infections of the bone grafts during irrigation, and 2 of the donor sites. There was 1 recurrence of osteomyelitis after skin healing and bone consolidation, and 1 case of pseudarthrosis. There were no “secondary” fractures. In 34 of the 38 patients (89%) the chronic osteomyelitis was eliminated.

Discussion

From the early days of our series we appreciated that in our situation, the use of relatively large quantities of normal saline would be a problem, and therefore we used only 1 litre each day instead of the 4 litres recommended by Roy-Camille [3]. Patients were only admitted when they themselves could provide 40 litres of this fluid. In order to help overcome this shortage, we alternated Dakin’s solution with the saline one day on two, and recently we treated successfully a child aged 7 years without irrigating the graft.

Plaster immobilisation was difficult, as the casts frequently disintegrated when wet. External fixators were much more satisfactory [1], as they could be applied well away from the infection. They allowed irrigation and could be used in patients of

Table 6. Bone consolidation

Site	Number of cases	Average time (months)
Tibia	15	7
Femur	15	6
Foot	2	4
Radius	2	3
Ulna	1	3
Unspecified	3	–
Under treatment	3	–

different sizes. They also maintained the length of a limb if a large segment of bone had to be removed.

Our very limited resources prevented accurate bacteriological support, and the supply of drugs was often difficult. Therefore we relied much more on adequate surgery according to the principles laid down in the Papineau technique. The difficulties resulting from this lack of laboratory support were well illustrated by the case of a 61-year-old man who was referred to us after 3 previous operations had failed to heal his chronic bone infection. Histological examination eventually confirmed the presence of tuberculosis, and fortunately a good result followed exhibition of appropriate drugs.

We have noted that Africans do not have large quantities of cancellous bone, and that 1 site may barely yield 50 ml. It was necessary to use 53 donor sites in 37 patients, and we preferred to use the proximal part of the tibia as it is more productive (Table 4).

Conclusion

Over a period of 10 years, 41 cases of chronic osteomyelitis have been treated in our hospitals in Kinshasa and we have found the Papineau technique to be appropriate and effective.

Spontaneous skin healing occurred in 3 months, and in 4.5 months after skin grafting. Bone consolidation took between 3 and 7 months. The Hoffmann external fixator was used in 44% of the cases, and is the ideal method for immobilisation. Adequate and thorough sequestrectomy is vital, and in our series we achieved 89% of satisfactory bone consolidation.

We believe that the Papineau technique, using materials which are locally available, is very suitable for use in the developing world, and is effective even when laboratory support is not very good, and when antibiotics may not be readily available.

References

1. Burny F, Rasquin C (1983) The “Papineau technique” using Hoffmann external fixation. In: Ackroyd B, O’Connor B, de Bruyn P (eds) *The severely injured limb*. Churchill Livingstone, New York
2. Papineau J (1973) L’excision-greffe avec fermeture retardée délibérée dans l’ostéomyélite chronique. *Nouv Presse Méd* 2: 2753–2755
3. Roy-Camille R, Guillaumon JL, Saillant G, Sagnet P, Lelièvre JF (1974) Traitement de l’osteite par excision-greffe a ciel ouvert selon la méthode de Papineau. *Mém Acad Chir* 100: 480–487
4. Roy-Camille R, Reignier B, Berteaux D, Saillant G, Mallet JF (1978) Technique de l’intervention de Papineau. *Ann Orthop Ouest* 10: 94–96
5. Vidal J, Allieu Y, Buscayret C, Paran M, Fischbach C, Brahini B (1978) Utilisation de la technique de Papineau dans le traitement des fractures ouvertes récentes avec perte de substance osseuse. *Ann Orthop Ouest* 10: 122–124