

Original Research Article

Predictive factors of malunion and nonunion at the Aristide le Dantec hospital

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ABSTRACT

Background: Malunion and nonunion are late complications that can occur during the fracture healing process. The aim of this study was to determine the predictive factors for malunion and nonunion

Methods: This was a retrospective study over a period of 43 months. Predictive factors were sought from patient, fracture and initial management data

Results: We recorded 72 consolidation disorders in 69 patients. malunion accounted for 54.1% and nonunion for 45.9%. The study population was divided as follows: 53 men and 16 women. The average age was 37.8 years. The patients lived in urban areas in 81.2% of cases. Comorbidities were present in 14.5%. The circumstances of fracture occurrence were dominated by traffic accidents, especially for 39 patients. The initial fracture was closed in 91.3%. Long bones were involved in 97.2% of cases, with a diaphyseal location in 52.8%. The fracture was simple in 79.1%, with 84.7% of the fractures being transverse. The tibia was the bone most affected by malunion (53.8%). Nonunion occurred in the humerus, femur and tibia in 27.3% each. Initial treatment was undertaken in 91.3% of patients.

Conclusions: Malunion and nonunion are a reality in our daily practice. These consolidation problems occur in young patients who are victims of road traffic accidents. Diaphyseal fractures of long bones with a transverse line have been the most frequently incriminated. conservative treatment and traditional practice have favoured the development of these complications.

Keywords: Malunion, Diaphysis, Nonunion, Traditional practice, Conservative treatment

INTRODUCTION

Malunion and nonunion are late complications that can occur during the fracture healing process. These sequelae pose a public health problem in sub-Saharan Africa due to their high frequency. This situation is explained by socio-cultural beliefs that encourage the practice of traditional medicine. This is often compounded by the inaccessibility of health care services and inadequate health infrastructure for the management of osteoarticular diseases.^{1,2} The aim

of this work was to determine the predictive factors of malunion and nonunion.

METHODS

This was a retrospective study over a period of 43 months (1 January 2015 to 31 July 2018) carried out in the orthopaedic-traumatology department of Aristide le Dantec hospital. This hospital is one of the four centres in the Senegalese capital that treats traumatological and

orthopaedic conditions. In addition, outside Dakar, there are 12 centres that deal with osteoarticular disorders. Senegal is a West African country with an area of 196,712 km² and an estimated population of 15,726,037.³ The information was collected from the consultation and operating room registers. This allowed us to collect 76 patient records.

Inclusion and exclusion criteria

We included in the study, patients who presented a callus and a pseudoarthrosis with a complete file including a clinical examination and a radiographic assessment. The exclusion criteria concerned incomplete files (missing radiographs, N=7).

Predictive factors were sought from the following data: The patient: age, gender, comorbidities, location (urban, rural), The initial fracture: the circumstances, whether or not the skin has been opened, the bone involved, the site of the fracture, the geometric aspect of the line and Initial management: surgical, conservative, traditional practice, absence. The data were entered and analyzed using the sphinx software.

RESULTS

Authors recorded 72 consolidation disorders in 69 patients. Three patients had both disorders. Malunion accounted for 54.1% and nonunion for 45.9%. The study population was divided as follows: 53 men and 16 women. The average age was 37.8 years with extremes of 10 years and 90 years. The age distribution is shown in (Table 1).

Table 1: Age distribution.

Age (years)	N	%
Under 14	2	2,9
15-21	8	11,6
22-59	54	78,3
60-75	3	4,3
76-89	1	1,4
90 and over	1	1,4
Total	69	100

Average: 37.8 years Extremes: 10 and 90 years

Table 2: Distribution by circumstances.

Circumstances	N	%
AD	9	13
AVP	10	14,5
AC	39	56,5
AS	6	8,7
AL	4	5,8
Fighting	1	1,4
Total	69	100

The patients lived in urban areas in 81.2% of cases and in 18.8% in rural areas. Comorbidities were present in 14.5% of our patients (Table 2).



Figure 1: Mal union of long bone (tibia and fibula).



Figure 2: Mal union of femur.



Figure 3: Nonunion long bone (humerus).

The different circumstances of occurrence (Table 3). The initial fracture was closed in 91.3% of cases and open in 8.7%. Long bones were involved in 97.2% of cases, with a diaphyseal location in 52.8%, a metaphyseal location in 32.8% and an epiphyseal location in 14.3%. Short bones

were involved in 2.8% of cases. The fracture was simple in 79.1%, comminuted in 13.9% and bifocal in 6.9%.



Figure 4: Nonunion short bone (scaphoid).

Table 4: Distribution of malunion according to the bone involved.

Bone affected by malunion	N	%
Humerus	6	15.4
Radius	3	7.7
Femur	7	17.9
Tibia	21	53.8
Fibula	2	5.1
Total	39	100

Table 5: Distribution of nonunion according to the bone involved.

Bones affected by nonunion	N	%
Humerus	9	27.3
Radius	3	9.1
Ulna	1	3
Femur	9	27.3
Tibia	9	27.3
Scaphoid	2	6
Total	33	100

For simple fractures, the line was transverse in 84.7% of cases and oblique in 15.3%. The distribution of malunion and nonunion according to the bone involved is depicted in (Table 4-5). Initial treatment was undertaken in 91.3% of the patients. The distribution according to the type of initial treatment is shown in (Table 6).

DISCUSSION

The distribution of consolidation disorders was almost identical in this work. Young men were the most affected by these conditions. This is partly due to the youth of the African population, and partly due to the fact that this age group is the most active and therefore the most exposed to trauma. Other authors have made the same observation.^{4,6} The predominance of young subjects explains the low rate of comorbidities observed. However, comorbidities are

generally considered as risk factors for the occurrence of consolidation disorders; the most incriminated are: diabetes, vasculopathies, hormonal disorders (hypothyroidism, growth hormone and oestrogen deficiency).⁷⁻⁹

Table 6: Distribution according to initial treatment.

Type of initial treatment	N	%
Traditional practice	25	36.2
conservative	26	37.7
Surgical	12	17.4
No	6	8.7
Total	69	100

In this work, the patients were mostly urban residents and road traffic accidents were the biggest contributors to fractures. The anarchic urbanisation of West African populations, the poor condition of roads and vehicles, and the increase in road traffic explain this situation.^{10,11} Concerning the parameters of the fracture, the closed character has been widely observed. In Africa, this character is more common.^{12,13}

The closed nature of the fracture exposes the patient less to consolidation problems, unlike open fractures. Open fractures remain a very important source of complications during healing.^{14,15} The initial fractures in this series were mostly simple with a transverse line. Transverse line fractures are known to be unstable with a high risk of secondary displacement. In the AO (Association for Osteosynthesis) classification they are considered the most severe of the simple fractures in terms of prognosis.¹⁶ Malunion and nonunion have mainly affected the long bones, especially in the diaphyseal area. The vascularisation of long bones is richer in the metaphyseal zone than in the diaphysis. The risk of malunion is therefore greater in the diaphyseal zone.^{15,17}

Malunion were mainly in the tibia. The predominance of this location is explained by the fact that we recorded more leg fractures. The leg is the limb segment most exposed to trauma. The tibia, femur and humerus were most affected by nonunion. The probability of nonunion occurring is high after fractures of "hypovascularised" bones (humerus, scaphoid, femoral neck, talus).⁷ The study by Laves et al also showed that these three bones were predominantly affected: the femur at 58.1%, the tibia at 17.6% and the humerus at 10%.¹⁸ The majority of our patients had been treated initially. Conservative treatment and traditional practices have been very prone to malunion.

The presence of malunion and nonunion in conservative treatment is related to either a reduction defect or a secondary displacement of the fracture. Traditional treatment is a scourge in our society. The consequences of this practice are devastating; the occurrence of consolidation problems, although frequent, is a lesser evil. Several authors report this phenomenon.^{1,2,13}

Limitations

The limitation of the study was its small sample size.

CONCLUSION

Malunion and nonunion are a reality in our daily practice. These consolidation disorders occur in young patients, victims of road traffic accidents. Diaphyseal fractures of long bones with a transverse line have been the most frequently incriminated. conservative treatment and traditional practice have favoured the development of these complications.

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