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ORIGINAL ARTICLE

Cost analysis of the diagnosis and treatment of soft tissue sarcomas in reference centres[☆]

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KEYWORDS

Sarcoma;
Cost;
Reference

Abstract

Objective: To determine the diagnostic and treatment costs in patients referred to a reference centre with a suspected soft tissue sarcoma.

Materials and methods: The study consisted of a historic cohort of 48 consecutive patients who were diagnosed with soft tissue sarcomas (STS) and treated in our centres between the years 2009 and 2011, both prior to and after performing the biopsy. The cost per procedure was taken from the official list of prices published in the year 2009. A comparative study of the data was performed using the Mann–Whitney U and Wilcoxon tests.

Results: The mean cost per patient was 14,427.58€. In those referred before the biopsy, the overall mean cost was 11,818.67€, and in those referred afterwards, it was 6456.74€ ($p = .0073$). There were no significant differences in the diagnostic costs between the groups. However, the mean cost of the treatment per patient was higher in the second group ($p = .0121$).

Discussion: The referral to centres with experienced multidisciplinary teams in this disease is a common fact highlighted in many articles, where the financial savings have also been demonstrated.

Conclusions: This study shows that, in addition to improving the care aspect of the patients when they are referred to a specialist centre prior to the biopsy, there is also a lower health care cost.

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PALABRAS CLAVE

Sarcoma;
Coste;
Referencia

Análisis de los costes de diagnóstico y tratamiento de los sarcomas de partes blandas en centros de referencia

Resumen

Objetivo: Conocer los costes diagnósticos y terapéuticos en pacientes derivados a un centro de referencia ante la sospecha de un sarcoma de partes blandas.

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Material y métodos: Cohorte histórica de 48 pacientes consecutivos diagnosticados y tratados en nuestros centros, tanto previo a la realización de la biopsia como posteriormente a ella, entre los años 2009 y 2011 con el diagnóstico de sarcoma de partes blandas. Los costes por procedimiento son extraídos de la orden de precios públicos del año 2009. Se realizó un estudio comparativo de los datos mediante la prueba de *U* de Mann–Whitney–Wilcoxon.

Resultados: El coste medio por paciente fue de 14.427,58 €. En los derivados previo a la biopsia el coste global medio fue de 11.818,67 € y en los derivados posteriormente fue de 16.456,74 € ($p = 0,0073$). No existen diferencias significativas en el coste diagnóstico entre ambos grupos.

Sin embargo, el coste del tratamiento medio por paciente fue mayor en el grupo B ($p = 0,0121$).
Discusión: La derivación a los centros de referencias con equipos multidisciplinares expertos en esta afección es un hecho común resaltado en muchos artículos en los que además se demuestra el ahorro económico que esto supone.

Conclusiones: En este estudio podemos ver que además de la mejoría en el aspecto asistencial para el paciente cuando se deriva a un centro especializado previo a la biopsia existe un menor coste sanitario.

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Introduction

Sarcomas are malignant tumours derived from mesenchymal tissue. Among them, STS are more common than bone sarcomas. Nevertheless, STS are a rare type of cancer. The diagnosis and treatment of this condition requires the collaboration of multiple specialists. Due to its rarity and the need for a multidisciplinary team with sufficient experience, multiple studies have shown that referring these patients to reference centres decreases morbidity and mortality.^{1–5} In addition, wrong decision-making also involves an increase in healthcare expenditure.

Materials and methods

We present a historical cohort study of 52 consecutive patients referred to our centres between 2009 and 2011 with a diagnosis of soft tissue sarcoma. Out of these patients, 2 were excluded from the study due to a lack of the necessary variables for analysis and another 2 patients were excluded because they had not completed the definitive treatment. Of the 48 patients included in the study, 32 were male and 16 were female (Fig. 1), with a mean age of 56 years (range: 18–89 years). The follow-up period lasted for 22.90 months (± 12.8 months).

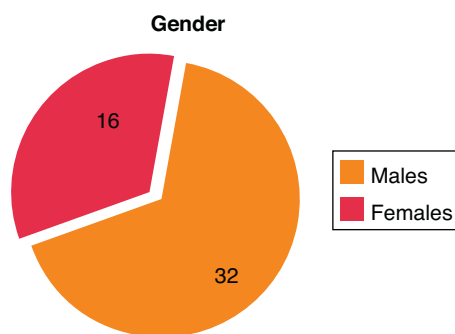


Figure 1 Gender distribution of patients included in the study.

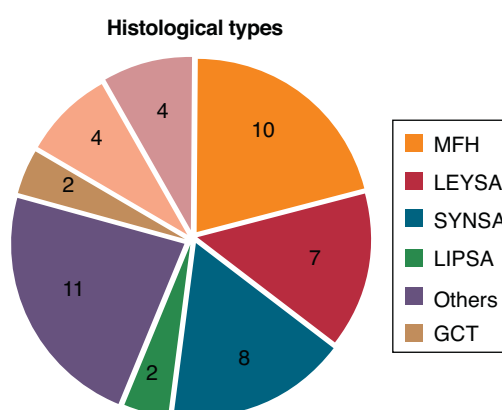


Figure 2 Histological types found in patients. GCT, giant cell tumour; LEYSA, leiomyosarcoma; LIPSA, liposarcoma; MFH, malignant fibrous histiocytoma; SYNSA, synovial sarcoma.

The most common histological type was malignant fibrous histiocytoma (10/48 patients: 20.83%), followed by synovial sarcoma (8/48 patients: 16.66%) and leiomyosarcoma (7/48 patients: 14.58%) (Fig. 2). The tumours were classified according to the American Joint Committee on Cancer (AJCC) classification for STS.⁶ This classification considers as superficial tumours those located exclusively above the superficial fascia without invading it and as deep tumours those located below the superficial fascia or else those which are above the superficial fascia but invade it. According to this classification, 27.08% of our sample (13/48 patients) was included in stages IA, IB, IIA or IIB and 72.91% (35/48) in stages III or IV (Fig. 3). The most common locations were the lower limbs, in 81.25% of cases (39/48 patients), followed by the upper limbs in 14.58% (7/48 patients) and the axial skeleton in 4.16% (2/48 patients) (Fig. 4).

The costs derived from diagnosis and treatment were divided into 4 groups. Group I included the diagnostic costs prior to referral, group II included those after referral, group III included those derived from the treatment prior to referral and group IV included treatment costs after referral.

In addition, patients were divided into 2 further groups: 21 patients (43.75%) who were referred prior to biopsy

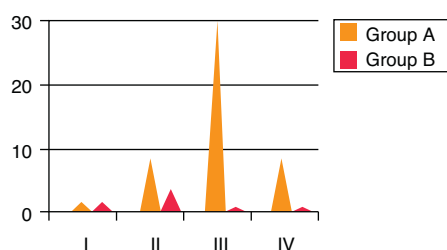


Figure 3 Ratio between disease stages according to AJCC 2010 and groups of patients.

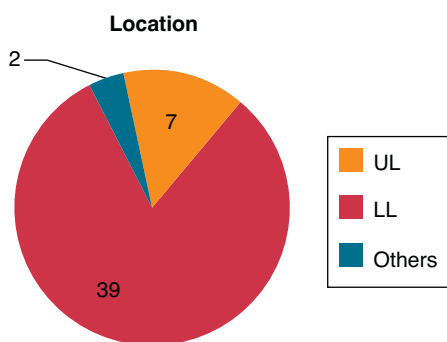


Figure 4 Location of sarcomas among patients included in the study. LL, lower limbs; UL, upper limbs.

(group A) and 27 patients (56.25%) who were referred after biopsy (group B). There were no significant differences between both groups in terms of age or gender. We considered as a treatment any procedure performed not only with the intention of identifying the disease, but also of eliminating it. Therefore, excisional biopsies were considered as a part of the treatment.

The costs derived from treatment included surgical and nonsurgical procedures, as well as the complications derived from both.

The diagnostic cost of simple radiographs and those caused by routine monitoring of patients were not counted.⁷ The costs included due to procedures were obtained from public prices as per 2009.⁸ Data were analysed using the software packages SAS® version 9.2 and Enterprise Guide® 4.2. We conducted a comparative study through the Wilcoxon and Mann–Whitney U tests.

Results

The overall cost of treating all patients referred for definitive treatment at our centres due to soft tissue sarcoma between 2009 and 2011 was 692,524.00€. The mean cost per

patient was 14,427.58€. In group A (patients referred before biopsy), the mean overall cost was 11,818.67€ (Table 1), while for those in whom the referral was delayed until after a biopsy was obtained, the mean cost per patient was 16,456.74€ (Table 2). This difference was statistically significant ($p = .0073$).

There were no significant differences in diagnostic cost considered separately between groups A and B. However, the mean treatment cost per patient was higher in group B ($p = .0121$).

The incidence of complications was higher among patients in group B, although this difference did not reach statistical significance.

The times until local recurrence of sarcomas and until appearance of metastasis were analysed by Kaplan–Meier curves. However, due to the low number of events (13% cases of local recurrence in group A and 24% in group B) we did not find a significant association between the timing of referral to the reference centre and local or distant relapse.

Discussion

Several studies have demonstrated that referral to multidisciplinary reference centres, where different specialists involved in the treatment of primary cancer work together, improves the likelihood of survival and limb salvage.^{1,9} The economic cost of limb salvage surgery and amputation surgery are considered to be similar,^{10,11} although social integration and self-perception are notably better in salvage surgery.^{11,12} However, we should attempt to consider the real benefits in quality of life and use them to justify the cost incurred.¹³

The literature shows that patients treated at non-reference centres suffer more local recurrences without an increased number of metastases and also generate higher costs.¹⁴ In our work, we obtained the same findings, attributable to the cost of reoperation after local recurrence and to the need for further adjuvant treatments.

In this preliminary study, we also aimed to find a lower healthcare cost in patients who were referred to reference centres before biopsy compared to those derived after undergoing invasive procedures.

There was no significant difference in the diagnostic cost considered separately between groups A and B. These results could be due to the anatomopathological diagnostic method employed at our centres, which in all cases included a percutaneous biopsy guided by a diagnostic ultrasound or CT scan. This procedure increased our diagnostic costs, whereas in other centres, biopsy was generally excisional and, therefore, considered as part of the treatment.

Table 1 Costs of patients referred prior to biopsy.

Variable		N	Cost (€)	Mean (€)
Diagnosis another centre	Diagnosis another centre	23	7596.00	330.26
Treatment another centre	Treatment another centre	23	0	0
Diagnosis reference centre	Diagnosis reference centre	23	46,908.00	2039.48
Treatment reference centre	Treatment reference centre	21	197,488.00	9404.19
Overall cost	Overall cost	21	248,192.00	11,818.67

Table 2 Cost of patients referred after biopsy.

Variable		N	Cost (€)	Mean (€)
Diagnosis another centre	Diagnosis another centre	27	48,204.00	1785.33
Treatment another centre	Treatment another centre	27	124,496.00	4610.96
Diagnosis reference centre	Diagnosis reference centre	27	30,136.00	1116.15
Treatment reference centre	Treatment reference centre	27	242,096.00	8966.52
Overall cost	Overall cost	27	44,433.00	16,456.74

Nevertheless, this difference did not reach statistical significance.

However, the mean treatment cost per patient was higher in group B ($p = .0121$). We believe that, in our study, this difference was due to the cost of reoperation after local recurrence and the need for further adjuvant therapies, which could be prevented through adequate diagnostic and therapeutic planning.

Our study was a preliminary assessment in which we observed a significant decrease in overall and treatment costs when STS cases were referred to multidisciplinary reference centres before biopsy. In our opinion, this difference was due to several factors. Firstly, there was an increased percentage of unplanned excisional biopsies in which sarcomas were only discovered after surgery. This then required reoperation in order to extend margins, adjuvant radiotherapy or entailed a higher rate of local recurrences which, as we have seen, increased the overall cost. Secondly, there was a trend towards more complications in patients in group B.

It would be interesting to increase the number of cases studied in order to enable a meaningful assessment of cost effectiveness curves, including radiographs and consultation time, as well as adjustment to quality of life.

Level of evidence

Level of evidence IV.

Ethical responsibilities

Protection of people and animals. The authors declare that this investigation did not require experiments on humans or animals.

Confidentiality of data. The authors declare that this work does not reflect any patient data.

Right to privacy and informed consent. The authors declare that this work does not reflect any patient data.

Conflict of interests

The authors have no conflict of interests to declare.

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