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Original Research Article

Utilizing Patient-Reported Outcomes, a Comparison of Limb Salvage Vs. Amputation for Nonmetastatic Sarcoma Patients Results from Measurement Information Systems

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Abstract

Objective: A scoring tool called the Patient-reported Outcomes Measurement Information System (PROMIS) enables comparisons between patients with uncommon disorders and those with more common illnesses or the general population. For nonmetastatic sarcoma patients, PROMIS results were compared between limb salvage and amputee patients to the general population.

Methods: The analysis covered 130 patients. Amputation and limb salvage cohorts of patients were separated, as well as groups based on the length of follow-up (1 to 10 or 12+ months).

Results: Seven PROMIS domains were examined, and patients who had just undergone surgery and those in the limb salvage group both received higher ratings. In comparison to the population, the limb salvage group also exhibited better emotional health.

Conclusion: PROMIS values have improved in both patients and limb salvage patients. One year following surgery. Patients undergoing limb salvage have better emotional health than the general public.

Keywords: Patient-Reported Outcomes Measurement Information System, Nonmetastatic Sarcoma Patients, Limb Salvage and Amputee Patients.

Introduction

Patient-reported Outcomes Measurement Information System (PROMIS), which is financed by the National Institutes of Health, is a patient-reported scoring tool that is becoming popular as a way to assess outcomes. This tool is distinctive in that it provides information based on health domains rather than questions about individual diseases. The PROMIS method can therefore measure variations in patients' reported quality of life that are unrelated to the underlying medical condition [1].

The PROMIS scoring system, which converts raw scores to T-scores, enables normalization of findings, much like an IQ test. This enables comparisons to be drawn between various medical disorders and the general population [2]. The reference

population used by PROMIS for this comparison has an average score that has been translated to a T-score of 50 and an SD of 10. The patient group in issue has less of the tested domain according to this approach, which may or may not be good depending on the tested domain. A result below 50 indicates as much. A score of 40 in the depression domain, for instance, would indicate that they believe their levels of depression to be lower than those of the general population. In contrast, if they receive a score of 40 in the ability-to-participate category, it indicates that they believe their ability to engage in customary social activities is lower than that of the general population [1; Figure 1].

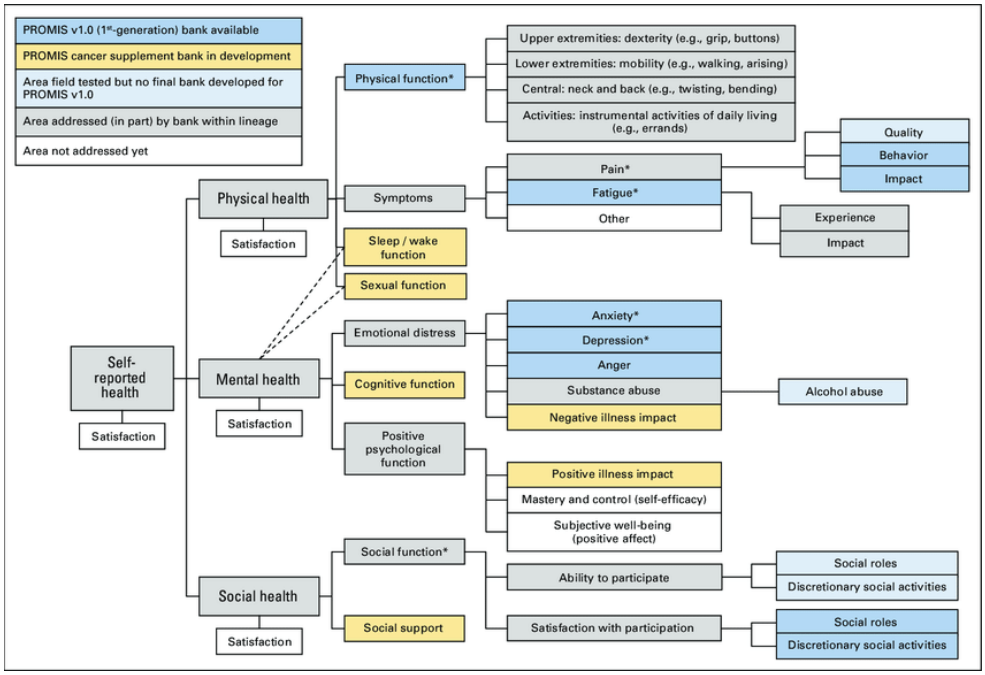

Figure 1: Patient-reported Outcomes Measurement Information System (PROMIS)

Few oncologic studies have employed PROMIS to assess outcomes, despite the clear differences between it and earlier scoring systems like the Musculoskeletal Tumor Society or Toronto Extremity Severity Score [3-5]. Thus, in order to provide normative values for upcoming comparison studies, we collected PROMIS data on patients with a diagnosis of nonmetastatic sarcoma.

Methods:

Study Design: This study is a prospective study carried out from January 2021 to April 2022 at SCB Medical College, Cuttack

Methodology: The analysis of the charts yielded demographic information. The pathology report was examined for diagnostic details and the surgery report for treatment specifics. At each subsequent clinic visit, PROMIS measurements were taken. The most recent PROMIS questionnaire was used in the analysis if a patient was seen more than once throughout the study period. The follow-up was based on the final surgical operation date for individuals who underwent numerous procedures. The PROMIS 40 Profile, which includes brief forms for seven different health domains such as physical function, anxiety, depression, exhaustion, sleep disturbance, ability to engage, and pain interference, was completed by the patients. The raw scores were then transformed into T-scores to enable population comparison.

The physical function domain evaluates both daily living activities and self-reported function of the extremities. Anxiety, depression, weariness, and disturbed sleep are perceived symptoms of their respective domains that are measured. The ability-to-participate domain gauges how well patients estimate their capacity to engage in regular social activities. Finally, pain interference evaluates how pain limits one's participation in activities [6].

Survey results were graded in accordance with the PROMIS Scoring Manuals and, when necessary, converted to T-scores. If participants answered half of the questions or four questions, whichever was more, as instructed by the scoring manual, missing data for that domain were interpolated using a weighted mean.

Sample Size: The final analysis included 130 patients.

Exclusion Criteria: All patients without a malignant sarcoma diagnosis, those who showed signs of metastatic disease, and those who had not yet had surgery were excluded.

Statistical Analysis: As indicated for group differences, the demographic variables were compared between groups using chi-square or analysis of variance. Interactions between independent variables were examined for multilevel analysis of variance. T-scores were compared to the mean of the US population using a one-sample Wilcoxon signed ranked test with a significance level of 0.05. Two-sided P values were regarded as significant for all statistical analyses, which were carried out in SPSS (IBM SPSS Statistics V24.0).

Ethical Consideration: The ongoing study was approved by the Ethical Committee of SCB Medical College, Cuttack

Results

The analysis comprised 130 patients in total. They were separated into those who received limb salvage and those who underwent amputations. These groups were then separated into early (follow-ups within 12 months) and late (follow-ups within 14 months). The follow-up for patients who underwent numerous procedures was calculated based on the date of the most recent surgical procedure.

Patients from 60 female (46%) and 70 male (54%) groups were analysed. It was 56 years old on average. Compared to 110 individuals (81%) who had a tumour in the lower extremities, 25 patients (21%) had one in the upper extremity. A prior unintentional resection occurred in 16 patients (11%) prior to the main surgical procedure. Radiation therapy was given to 65 individuals (46%) in total.

This therapy was used to treat Ewing sarcoma and soft tissue sarcoma. Neoadjuvant therapy was given to the majority of individuals with these sarcomas. Patients who had narrow margins at the time of surgical resection and those who had a re-excision of an accidentally removed sarcoma were the only ones who received adjuvant therapy.

35 patients (26%) received chemotherapy. Osteosarcoma, synovial sarcoma, and Ewing sarcoma were all diagnosed using this chemotherapy. Young patients with soft-tissue sarcomas without metastatic disease were also treated with chemotherapy in a few instances, at the medical oncologist's discretion. Regarding age, gender, location, unintentional resection history, or gender, there were no significant variations between the groups. Table 1 lists the demographics of the patients.

Table 1: Baseline characteristics of the patients

Parameters	Limb Salvage Early	Limb Salvage Late	Amputation Early	Amputation Late	P Value
Age (mean±SD)	57±17	56±18	57±22	61±16	0.90
Gender					
Male	15	45	5	5	0.67
Female	15	40	2	3	
Upper extremities					
Yes	6	16	1	1	0.702
No	18	71	6	12	
Prior resection					
No	23	75	6	13	0.58
Yes	1	11	1	2	
Time from Surgery to the survey (mean±SD)	5.1±3.5	56±18	57±22	61±16	<0.0002
Pain Visual Analogue (1-10; Mean±SD)	4.2±2.7	3.5±2.5	4.6±1.8	3.0±2.6	0.32

14 patients in the early limb salvage group had soft tissue resection. Five of the 10 patients who had bone excision had their joints replaced with endoprosthetic devices. One patient who had an acute amputation had a hand ray resection. One patient needed a hip disarticulation, while two patients received extended external hemipelvectomy. Moreover, 2 patients needed amputations above the knee and 2 patients needed amputations below the knee.

In contrast, 58 patients in the late limb salvage group underwent a soft-tissue operation solely. 28 additional patients required bone excision, and 15 of them underwent an endoprosthetic arthroplasty reconstruction. Two patients needed a hand ray resection, two needed an external hemipelvectomy, and one patient had to have their hip disarticulated in the late amputation cohort. Two patients had an amputation below the knee, two patients had an amputation above the knee, and two patients had a foot ray resection.

Based on the acuity of the surgical technique, there was a significant difference in the physical function T-score, with an increase in the average score in the latter cohorts. Physical function T-scores differed similarly depending on the type of surgery, with greater scores shown in individuals who had their limbs saved. The sharpness of the surgical treatment also made a significant difference in the ability to participate and pain interference domains, however the type of procedure did not have a similar impact.

After these comparisons, it was examined at the T-score variance between the late cohorts and the overall population. There were quite a few differences. indicated physical function interventions, including amputations and limb salvage, resulted in ratings that remained lower (worse) than the mean. There was no discernible difference between the cohorts and the overall population in the anxiety health domain.

In the limb salvage group, depression scores were significantly lower (better)

than the general population, whereas in the amputation cohort, they were comparable to the general population. Similar to the fatigue and sleep disturbance domains, the limb salvage group's scores were lower (better) compared to the general population, whereas the amputation cohort's scores remained the same as the general population. It's interesting to note that patients in the limb salvage cohort perceived their capacity to engage in everyday activities as being greater (better) than people in the general community. The amputation cohort and general population did not differ in this way.

Discussion

In earlier studies, survival and functional outcomes following limb salvage and amputation treatments for sarcomas were compared [7–13]. These studies, however, rely on oncology-specific scoring systems that cannot be compared across medical conditions, such as the Musculoskeletal Tumor Society or patient-reported systems like the Toronto Extremity Severity Score. As an alternative, a strong tool for analysing patient-reported quality of life measurements is the PROMIS questionnaire. This approach enables comparisons to be made between uncommon diseases and more prevalent ailments, or even the general population, due to the normalisation of scores [14]. This will enable medical professionals to document improvements in patients' quality of life following the treatment of uncommon conditions like sarcomas and to contrast their findings with those of more widespread diseases, with which some patients may be more familiar. In order to give these normative values for postoperative patients with nonmetastatic sarcomas and to compare the quality of life after limb salvage and amputation, this research was created.

The T-scores for the physical function domain, which gauges patients' perceptions of their function and capacity to carry out activities of daily living, were shown to be poor following surgery in this study. Their scores tended to rise over time, getting closer to normal levels but not quite there. The surgical method used also made a significant difference in scoring, with the limb salvage cohort showing greater physical function scores. This result is consistent with a number of earlier studies that have shown a functional advantage following limb salvage surgeries, but it is virtually probably subject to selection bias and should be read with that awareness in mind [15,16].

Intriguingly, patients in our study originally reported poor scores in the ability-to-participate domain, which assesses perceived capacity for social interaction. When compared to that of the general population in the late follow-up group, this value rose to normal levels in the amputation cohort and to noticeably higher levels in the limb salvage cohort. The results of Gradl et al. [17] comparison of the functional outcomes of rotationplasty patients and a healthy German sample cohort are identical to those of this study.

They found that rotationplasty patients significantly outperformed the overall population in terms of social functioning and mental health. Also, regardless of the type of surgery or even the severity of the procedure, we found no difference between patients in the emotional health categories of anxiety, depression, exhaustion, or sleep disturbance. However, in line with other research, we discovered that patients with a history of nonmetastatic cancer who received limb salvage reported significantly less trouble with depression, exhaustion, and sleep disturbance when compared with the general population [18].

This finding is comparable to one made by Groenvold et al. [19], who found that a cohort of breast cancer patients experienced significantly reduced levels of anxiety and depression when compared to a control group made up of women from the general

Danish community. They questioned the reliability of their scoring system, but we contend that a plausible explanation for these results may be due to patients' changing expectations after being told they are cancer-free.

In a prior study, PROMIS health domains for patients with metastatic bone disease and the general population were compared [14]. They discovered similar levels of depression in the two groups. Ottaviani et al. [20] also contrasted the long-term effects of limb salvage versus amputation in terms of lifestyle, health, income, marital status, occupation, and education. They discovered no differences in the groups' employment position, marital status, or educational attainment. Overall outstanding functional and quality of life outcomes were discovered by Nagarajan et al. [21] in both the amputee and limb salvage groups. They failed to identify a distinction between the groups. Last but not least, a study by Pardasaney et al. [22] compared limb salvage to amputations and discovered similar results when comparing a below-knee amputation to a limb salvage treatment, but a functional advantage with limb salvage when the amputation was at a more proximal level. [23,24]

Conclusion:

Those who were farther away from surgery (<11 months) showed several PROMIS health domain improvements. Additionally, it was discovered that patients who underwent limb salvage had significantly higher scores in the physical function domain when compared to the cohort of people who had their limbs amputated, as well as higher scores in the emotional health domains when compared to the general population.

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