Clinical Outcomes of Patients Treated with Proximal Tibial Reconstruction

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OBJECTIVES

The purpose of this study is to examine the clinical outcomes of patients treated with different modalities of proximal tibial reconstruction for malignant or benign, locally aggressive primary bone and soft tissue neoplasms. Treatment modalities include as endoprosthesis (cemented and cementless), allografts (osteoarticular, hemiarticular, high intercalary and high hemi-intercalary with or without vascularized fibula autograft, and vascularized fibula autograft alone), allograft composites, knee fusions, rotationplasty, and reconstruction with custom 3D printed implants. This is a multi-institutional study, and the goal is to establish a sample size of >5000 that would permit high-quality analyses per subgroup of reconstruction allowing for different comparative retrospective studies. The results of these studies will help to identify the most critical problems with proximal tibial reconstruction while establishing a platform for future collaborative prospective studies. To develop AI calculators to predict survival, outcomes, complications, and modes of failures for current reconstruction techniques.

BACKGROUND

The proximal tibia is one of the most common locations for primary bone tumors. It frequently undergoes reconstruction following tumor resection in order to restore knee joint function and hence, the ability to walk and stand. Previous studies report variable outcomes for patients treated with one of many reconstruction options, such as an endoprosthesis, osteoarticular allograft, allograft-prosthesis composite, or any of the other listed reconstructions above. There is a critical need for data comparing technique-dependent patient outcomes, as this anatomical site reports high complication rates and each reconstruction method poses unique benefits and risks. The current literature is very limited due to the lack of studies with enough power. Additionally, most studies are not comparative and very few are prospective. There is a lack of homogeneous modes to evaluate or quantify function across the board.

STUDY DESIGN

Study population

This is a multi-institutional study, and the goal is to establish a sample size of at least 5000 that would permit a high-quality analysis. Proximal tibial reconstruction patient data will be collected from the following institutions:

1. Massachusetts General Hospital
2. Brigham & Women's Hospital
3. Gujarat Cancer Research Institute
4. The Hospital for Sick Children
5. University of Florence
6. Mount Sinai Hospital of Toronto

7. University of Miami
8. Universidad Católica de Chile
9. University of Padova
10. Universidad Nacional de Rosario
11. Beth Israel Deaconess Medical Center
12. Columbia University Irving Medical Center
13. Instituto Nacional de Cancerologia Colombia
14. Rothman Orthopaedic Institute
15. Balgrist University Hospital
16. University of Pittsburgh Medical Center
17. Hospital Universitario Austral
18. Johns Hopkins Medicine
19. MD Anderson
20. University of Chicago Medicine
21. Stony Brook Medicine
22. Hôpital Maisonneuve-Rosemont
23. Groote Schuur Hospital
24. Karolinska Hospital and Institute
25. Hospital Italiano de Buenos Aires
26. Hospital Universitario La Paz
27. Yale Medicine
28. UCLA Medical Center
29. Leiden University Medical Center
30. Oslo University Hospital
31. Vanderbilt University Medical Center
32. UC Davis Medical Center
33. University Hospital Mainz
34. University Hospital of Pisa
35. City of Hope National Medical Center
36. Hospital Quirón Barcelona
37. University Medical Center Groningen
38. Royal National Orthopaedic Hospital
39. Memorial Sloan Kettering
40. Mount Sinai New York
41. University of Florida
42. McMaster University
43. Mayo Clinic
44. West Virginia University
45. Moffitt Cancer Center
46. Copenhagen University Hospital
47. Montefiore Medical Center
48. Rush University Medical Center
49. HUSI Colombia

50. Ohio State Medical Center
51. Clínica Imbanaco
52. Clinica Las Americas
53. Hospital Universitario San Ignacio
54. Careggi University Hospital

All participating hospitals/institutions have agreed to collect the same information following the same format. Data use agreements (DUAs) will allow for transfer of data between participant institutions and MGH. Once the entirety of the data is completed, a series of retrospective comparative studies will be prepared by the group. All data will be anonymized. Ultimately, the data will be transferred to the International Society of Limb Salvage (ISOLS). Following approval from the ISOLS, applying institution's IRBs, and necessary new DUAs, additional studies will occur. All DUAs will include the transfer of data to ISOLS. For each new and/or additional studies, new DUAs will be executed to reuse the same data based on the research policies of each of the participating institutions.

Data & specimen

Patients of all ages and genders are eligible for participation. No biological specimens will be collected during this study, as it is retrospective in nature.

Procedure

The study design is a retrospective chart review of patients who received proximal tibial reconstructions. Data on patient demographics, pre-operative labs, tumor characteristics, oncologic treatments, surgical treatments, endoprosthesis characteristics, allograft/APC/rotationplasty characteristics, complications, mobility, oncologic outcomes, and patient-reported outcomes will be extracted from their charts and inputted into REDCap for later database construction and statistical analyses. (REDCap survey included for reference). Each institution will submit a contact person and be assigned a REDCap ID number based on the geographical location.

Data analysis

The study involves a very extensive data collection for numerical, ordinal, and nominal variables with parametric and non-parametric distributions. Numerical variables, such as pre-operative laboratory values or resection length from joint to cut, can take on any value within a finite or infinite interval. Parametric analyses test for a linear relationship between numerical variables, thereby drawing assumptions about the population distribution from which the sample is drawn. Ordinal (ordered) and nominal variables, such as PROMIS Physical Function Score at Max Follow-Up and gender, respectively, are non-parametric. The Kruskal Willis test, a method of non-parametric analysis, to determine if there are statistically differences between two or more ordinal or nominal variables. Parametric and non-parametric distribution analyses will indicate whether patient report different outcomes depending on their demographics or treatment options. Such data will optimize the standard of care for proximal tibial reconstructions.

PRIVACY, CONFIDENTIALITY, & DATA SECURITY

As part of the study, the following sensitive/personal information will be collected: coded encounter data (diagnoses, procedures, dates), demographic data (age, gender, vital status), discharge summary, history/physical, medication list, office/clinic notes, operative/procedure notes, problem list, laboratory reports, pathology reports, and radiology reports, and HIV status. Data will be collected based off the Charlson Comorbidity Index, and AIDS is one of the comorbidities listed to collect.

There is no de-identified database of patients treated with proximal tibial reconstruction as of now. Identifiers are necessary to obtain the information from these patients and will be de-identified after collection.

We will protect the identifiers from improper use and disclosure by storing the information on a password-protected database which can be accessed only by study personnel, all of whom have completed training in HIPAA guidelines and requirements. Additionally, we will destroy the identifiers at the earliest opportunity consistent with the conduct of the proposed clinical research, unless there is a health or research justification for retaining the identifiers or such retention is otherwise required by law. Finally, the requested PHI will not be reused nor disclosed to any other person or entity, except as required by law or for authorized oversight of the research study.

It would be very difficult and expensive to locate and contact all the subjects eligible for this study. There are limited resources available and locating/sending letters and consent forms would be far too expensive. If data is only collected from individuals from whom we were able to obtain informed consent, the scientific validity of the study would be negatively affected.

The rights and welfare of the subjects will not be adversely affected. Various measures will be put in place to protect the privacy of subjects and confidentiality of any data. Identifiable data will be stored securely with access limited to only study staff, and information resulting from this study will not have any important health/medical implications for subjects. DUAs will be put in place for each institution participating in this study. Any identifiable information will be removed prior to analysis and publication.

The REDCap project and study database will only be accessible by staff members with protocol access. All staff will have or will be trained on the importance of data confidentiality.

RISKS & BENEFITS

As this is a retrospective chart review, the risk to subjects is minimal. Still, there are possible risks to privacy in terms of protected health information, but all efforts will be made to ensure that this does not occur.

The patient will not personally benefit from this study, but future patients undergoing proximal tibial reconstruction may benefit in the future. The results will identify the optimal tibial reconstruction method, which maximizes patient benefits and minimizes any associated complications. Patients will not be paid for this study.