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When do orthopedic oncologists consider the implantation of an expandable prosthesis in bone sarcoma patients?

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Background: According to literature indications for the implantation of growing prostheses are a minimum age between eight and ten years as well as an expected growth deficit above 3-4 cm. Some orthopedic oncology centres do not recommend growing prostheses in metastatic disease. The aim of this survey was to analyse the indications leading to the implantation of growing prostheses in bone sarcoma patients in different orthopedic oncology centres. Therefore we asked about (1) the personal experience of survey participants with expandable prostheses, (2) specific factors influencing the decision for or against the implantation of a growing prosthesis and (3) alternative surgical options, other than expandable prostheses, to compensate for limb length inequality.

Methods: A ten-minute web-based survey was sent via email to 96 active, orthopedic oncology members of the European Musculo-Skeletal Oncology Society (EMSOS). Participants were asked about their experience in orthopaedic oncology and the number of expandable prostheses implanted over the last three years. Specific factors reported in literature to influence the decision upon the implantation of growing prostheses, i.e. age at initial diagnosis, expected growth until adulthood, the presence of metastatic disease and alternative surgical options, were asked in individual questions. Finally we asked for the preferred surgical treatment in three constructed case scenarios.

Results: Forty-four members of EMSOS, from fifteen different countries, completed the survey (46% response rate). Personal experience of participants (1) showed that sixty-one percent (n=27) of the participants implanted between one and fifteen growing prostheses over the last three years, whereas 30 % (n=13) did not implant any. (2) The mean minimum age is stated as 6.6 years (range 1-10, \pm 2.4 SD). 3-5 cm of predicted growth deficit is considered the minimum for the implantation of a growing prosthesis by 60 % (n=25) of participants. At least one growth calculation method is applied by 66 % (n=27) of surgeons to calculate the expected growth deficit. A majority of participants uses Paley's multiplier method (31%, n=11), followed by bone age estimation (22%, n=8) and conventional growth charts (19 %, n=7) Two out of three surgeons would rather not implant a growing prosthesis in children with metastatic disease Concerning alternative or additional surgical options (3), epiphysiodesis to guide growth is considered by 41 % of participants. 71 % (n=27) of surgeons would rarely or never implant "dummy" prostheses. Alternatively, one half of surgeons would lengthen by callus distraction, either with intramedullary nailing devices or Ilizarov technique. The answers given in the case scenarios were consistent with the individual questions.

Conclusions: With regard to literature, our survey confirmed 3- 4 cm as the minimum of estimated growth deficit. The minimum age for the implantation of a growing prosthesis in this survey was 6.6 (range 2- 10) years. This is younger than reported in previous publications. It remains unclear whether growing prostheses are indicated in patients with metastatic disease, as answers were quite heterogeneous. It could not be answered within this survey why one fourth of orthopedic surgeons did not implant expandable prostheses. Except for the consensus on the minimum estimated growth deficit, all other answers were heterogeneously distributed in this survey. On the basis of the survey results a multicenter study on the outcome of expandable prostheses could be developed, as the number of growing prostheses implanted at each center is low.