Growth pattern of tibia after the passive implant insertion in adolescent patients with sarcoma in the Femur

Background: Limb length discrepancy is still the troublesome complication for younger patients with limb salvage even though extendible endoprosthesis has made great progress. Protecting the disease-free epiphysis should always the first choice to decrease LLD. While the passive implant insertion in the tibia of affected limb for young patients with sarcoma in the femur may influence the growth potential of proximal tibia. Evaluating growth pattern of the tibia after passive implant insertion may help to improve the prosthesis design and operation skill.

Questions/Purposes: Comparing the normal limb, to what extend the growth potential of the proximal epiphysis of tibia was inhibited after passive implant insertion and if distal epiphysis of tibia could compensate the growth inhibition.

Patients and Methods: 32 patients with sarcoma in femur under 12 years old who underwent extendible limb salvage were retrospective reviewed. The stem of tibia implant used in the current study was biological stem about 10mm in diameter with two thin nail to protect from rotation. Only Patients who survived until skeletal maturation and followed up periodically with full length radiological record of both limbs were included in this study. Patients underwent any revision operation other than periodically lengthening were excluded from this study. The x-ray film of both limbs was taken every half year after the operation. Arrest line is a marker of growth arrest caused by chemotherapy. The growth of each epiphysis was measure by the distance between the arrest line and new epiphysis line. The length of femurs, tibia and the growth of proximal and distal epiphysis and distal femur epiphysis were measured in the x-ray film periodically. The contribution of both proximal and distal epiphysis to lengthen of tibia was evaluated. The length of both tibia were compared and the difference of growth potential of both proximal and distal epiphysis of tibia was compared.

Result: Totally 12 patients with all the data required were included in this study. The age was 9.75±1.48years old and the mean follow-up is 6.3±2.1years. In most cases the arrest line of porximal tibia was obscure ,thus the growth of the proximal epiphysis was difficult to measure. All the distal arrest line at the uninterrupted limb was clear to measure. The mean length ratio of the affected tibia /normal limb was 96.78% 14months after operation, 94.38% 26months after operation and 92.31% months after operation; The contribution of the proximal epiphysis to the full length of tibia in the normal limb was 3.10%±0.29%, 5.45%±1.86% and 6.86%±2.38% accordingly; The contribution of the normal distal epiphysis was2.67%±0.61%, 4.31%±1.64% and 5.63%±3.35% accordingly . There is no significant difference between the growth of the normal and affected distal epiphysis(t-test, $p>0.05$). Thus the contribution of the affected proximal tibial epiphysis was estimated as 0.55%, 1.31% and 2.06% accordingly.

Conclusion: The growth potential of the proximal tibia was greatly inhibited by the passive tibial implant insertion in the current study, while the distal epiphysis did not compensate the growth inhibition of the proximal epiphysis. Thus improved prosthesis design and operation skill are needed to protect the proximal epiphysis of tibia.

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