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AN UNCEMENTED SPREADING STEM FOR DISTAL FEMORAL FIXATION AFTER INTERCALARY OR EXTENSIVE RESECTION OF THE PROXIMAL FEMUR

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INTRODUCTION

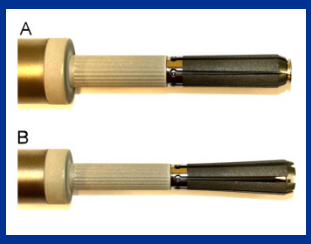
One of the major drawbacks of endoprosthetic reconstruction is implant failure due to aseptic loosening. Complications of aseptic stem loosening were observed in custom, modular and expandable prosthetic implants. Usually the distal tip of prosthetic femoral replacements is anchored in the lower quadrant. Because of the significantly increased life-expectancy attributed to advances of chemotherapy, the mechanical demands placed on the prosthetic devices are increasing as well. Therefore, the long-term survival of tumor prosthesis is crucial to the patient's quality of life. The literature showed that 6 – 20% of all patients treated with endoprosthetic reconstruction required revision surgery of the femoral component [3, 10]. These authors also showed that many patients will outlive their implants and most likely require revision surgery.

After intercalary or extensive diaphyseal resection together with the proximal femur, the remaining distal part of the femur is short. We asked the question whether a novel prosthetic design using a spreading mechanism for rigid uncemented fixation may be durable in a patient with only a short meta- epiphyseal femur after tumor resection.

		Total number of patients	Tumor classification		Stem Cementation	Mean Follow-up (Months)	Implant system	Kaplan-Meier survivorship at 5y	Complications (%)				
			Primary	Secondary					Infections	Loosening	Hip dislocation	Local reoccurrence	Total
Modular System	Chandrasekar et al [2] - 2009	100	35	65	Yes	24.6	Stanmore Implants	91%	7	1	6	4	18
	Porter et al [17] - 2009	59	22	39	Yes	55.4	Stryker Orthopedics	93%	5	3	7	0	15
	Finstein et al [11] - 2007	62	30	32	Yes	60	Bipolar	41%	5	10	5	7	27
	Farid et al [9] - 2006	52	34	18	Yes	146	Bipolar and Acetabulum Resurficing	86%	5	10	6		
	Menendez et al [16] - 2006	96	24	72	Yes	18.1	How medica	82%	6	0	2	3	11
Custom-made System	Natarajan et al [18] - 2003	44	41	3	Yes	57.8		87%	9	2	9	5	25
	Ilyas et al [12] - 2002	15	15	0	No	80.4	Kotz (HMRS)		13	7	20	7	47
Average of all studies included								80%	7	4	8	4	24

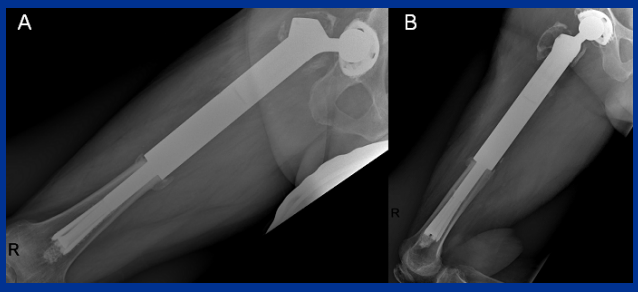
SURGICAL TECHNIQUE

After tumor resection, a precise oblique osteotomy of the femur is recommended. The spreading stem prosthesis [ArgoMedical, Zug, Switzerland] includes a grub screw, guiding bolt, expanding nut, expanding rod and a hollow threaded bolt for the femoral head prosthesis (Figure 1). The shoulder of the spreading prosthesis ideally directly abuts the remaining femur in order to guarantee anchoring of the stem after spread. The non-spreading part anchored in the medullary cavity has a primary layer of titan covered by a widely used hydroxyapatite layer. The spreading lamellae are processed by corundum in order to achieve surface amplification. The reamer for the medullary cavity is of cylindrical shape and of 14, 16 or 18 mm diameter. The length of the reamed part should be at least 12 cm from the edges reaching into the femur. After double-cheking the length of the final prosthesis, the spreading stem is brought into its final position. An Allen wrench is inserted into the hexagon socket of the grub screw which is part of the neck of the prosthesis. By turning the screw, the expanding nut causes rearward movement of the expanding rod and its guiding bolt. The cone shaped tip of the expanding bolt leads to spreading of the stem with inward movement. Because of the screw mechanism, the six blades of the prosthesis are infinitely adjustable. The blades of the prosthesis are 70 mm long and hydroxyapatite-coated. The grub screw has a locking mechanism if the implant is spread to a total angle of 30° on both sides (Figure 2), measured from the midline of the prosthesis. The intramedullary part of the implant is available in a diameter of 14, 16 or 18 mm, respectively, and has a total length of 120 mm. The prosthetic neck piece is 150 mm long with an extension module of 65 mm.



RESULTS

We present a 55 yo patient in whom the spreading stem prosthesis was used for the reconstruction of the proximal femur. He presented with increasing night pain in his right hip for three months. Pre-operative x-ray and magnetic resonance imaging showed an extensive intramedullary tumor without extraosseous extension. A biopsy revealed a chondrosarcoma. The patient underwent a resection of the proximal and diaphyseal right femur with reconstruction using the uncemented spreading stem. At the most recent 12 year follow-up, the patient is free of (local and systemic) recurrence, with the implant still in place. No revision surgery was ever necessary, particularly no revision regarding the spreading anchoring system. The patient remains without pain and is walking without crutches.



CONCLUSION

The spreading stem may represent an alternative option for fixation of a prosthetic device in the remaining distal femur after extensive tumor resection. Longer-term follow-up of a series of patients is needed to prove this novel concept.