

1 **Title 10590**  
2 Are we aggressive in performing two-stage reimplantation for periprosthetic infection after tumour resection  
3 around knee?  
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25 This study was performed at Oncology Department III, Rizzoli Orthopedic Institute, via G.C.Pupilli, 1-40136  
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28 **Conflict of interest statement:**

29 Each author certifies that he has no commercial associations that might pose a conflict of interest in  
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## Abstract 10590

**Background:** Infection is the commonest and dreaded mode of failure in tumor endoprosthetic reconstruction. Management of periprosthetic infection after tumor resection consists of antibiotics, irrigation-debridement and retaining of prosthesis, one-stage revision surgery, two-stage revision surgery and amputation with varying success rates and no clear evidence of superiority. Two-stage surgery whereas has proven to be effective even on long term for periprosthetic infection in tumor endoprosthesis in few studies.

**Questions and purposes:** a) Analyze the outcome of two-stage reimplantation for periprosthetic infection after tumor resection around knee; b) To determine possible risk factors for failure of planned two-stage reimplantation.

**Methods:** Heterogeneous population of 49 patients with periprosthetic infection after tumor resection around knee were treated during period July 2004-June 2014. The median follow up of the 49 patients was 31 months (range, 6-121). There were 28 males and 21 females with median age of 24 years (range, 11-79). Distal femur involvement was 38 and proximal tibia 11. Post operative chemotherapy was provided in 35 patients. Aggressive debridement was followed by partial explantation of diaphyseal stems in 22 patients compared to complete explantation in 27 followed by pulse lavage and antibiotic cement spacer implantation in the first stage. Mean number of antibiotic cement spacers was  $1.9 \pm 1.4$  per patient (range, 1-9) with 22 patients undergoing multiple applications. Systemic antibiotics were provided and presence of infection reassessed prior to reimplantation of tumor endoprosthesis. Possible risk factors for failure such as site, organism-virulence, type of explantation, antibiotic cement spacer and time to reimplantation were assessed.[Table 1]

**Results:** At median follow up of 34 months, successful salvage of infected limb was possible in 40 of 49 patients (81.6 %). However, only 35 (71.4%) were achieved free of infection after the first two staged procedure. Most common organism isolated was staphylococcus epidermidis (n=21) followed by staphylococcus aureus (n=12) and no organisms isolated in nine patients. Median time to reimplantation was 12 weeks (range, 6-90). At time of planned two-stage reimplantation, 43 patients were implanted with tumor endoprosthesis while six patients underwent amputation for failure to control infection. Of 43 patients, articulating tumor endoprosthesis was implanted in 36 compared to knee arthrodesis in seven (eight silver coated endoprosthesis was implanted). Infection relapsed in eight patients, treated by subsequent two stage reimplantation in two, debridement-lavage in two, amputation in three and antibiotics in one respectively. Time to reimplantation (greater than 8 weeks) had 13 failures and was statistically significant at  $p$  value=0.043 (CI 95%: 0.02~1.2) on univariate analysis. There was no statistical significance towards failure when partial explantation was performed at first stage (6/22 compare to 9/27 in complete explantation,  $p$  value=0.60). Attempt at multiple debridement and antibiotic spacer application did not significantly improve cure. The incidence of failure was high in group which underwent arthrodesis at second stage, which was statistically significant at  $p$  value=0.002 (CI 95%: 0.16~0.61). One failure was noted in eight patients who underwent silver coated tumor endoprosthesis implantation at second stage. There was no clear correlation between sites of tumour resection, organism-virulence and time to infection with failure of two-stage surgery similar to reports in literature. Mean MSTS in salvaged knee (n=41) was  $24 \pm 4$  (range, 7-28).[Table 2]

**Conclusions:** Two-stage reimplantation when performed aggressively by 8 weeks after explantation improves the success of limb salvage. Complete explantation of prosthesis may not be essential to eradicate infection, even in multiresistant organism setting. If clinical and laboratory signs of infection last more than 6-8 weeks, it is advised to repeat aggressive debridement-lavage and new antibiotic cement spacer application. Silver coated endoprosthesis may prove beneficial in controlling infection in larger long term studies.

**Level of evidence:** Level III, retrospective study

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**Table 1. Treatment related details of patients who underwent two-stage surgery**

<b>Type of explantation</b>	n=49
Partial	22
Complete	27
<b>Mean defect</b>	19±5.5 cm (range, 10-33)
<b>Mean number of antibiotic cement spacer</b>	1.9±1.4 (1 to 9)
<b>Attempts at antibiotic cement spacer application</b>	
Single	27
Multiple	22
<b>Median time to planned reimplantation</b>	12 weeks (range, 6-90)
<b>Median CRP at planned reimplantation</b>	0.6 g/dl (range, 0.1-8.5)
<b>Median ESR at planned reimplantation</b>	28 mm/hr (range, 2-100)
<b>Procedure at planned reimplantation</b>	
Amputation (chronic infection)	6
Arthroplasty	36
Arthrodesis	7
<b>Type of prosthesis</b>	<b>Reimplantation, n=43</b>
Non-silver coated	35
Silver coated	8
<b>Median time to relapse of infection</b>	6.5 months (range, 1-47)
<b>Mean number of procedures per patient</b>	3.2±1.6 (range, 2-10)
<b>Mean MSTS* (n=41)</b>	24±4 (range, 7-28)

121 \*: Musculoskeletal tumour society scoring system for lower limb-total score of 30

122 **Table 2. Possible risk factors associated with failure of two-stage reimplantation procedure**

	No. of cases	No. of Failure	P value	CI (95 %)
<b>Site</b>			0.59	
Distal femur	38	11		
Proximal tibia	11	3		
<b>Time to infection</b>			0.445	
< 3months	3	1		
3 months to 2 years	13	4		
>2 years	33	9		
<b>Organism isolated</b>			0.82	
Staphylococcus epidermidis	21	6		
Staphylococcus aureus	12	5		
Others	7	1		
Negative	9	2		
<b>Resistant strains</b>			0.89	
MRSA/MRSE*	9	2		
Others	40	12		
<b>Type of explantation</b>			0.60	
Partial	22	5		
Complete	27	9		
<b>Antibiotic cement spacer</b>			0.956	
Vancomycin only	30	10		
Vancomycin & others	19	4		
<b>Time to reimplantation</b>			<b>0.043</b>	0.02~1.2
≤ 8 weeks	19	1		
> 8 weeks	30	13		
<b>Reimplantation procedure (n=43)</b>			<b>0.002</b>	0.16~0.61
Arthroplasty	36	5		
Arthrodesis	7	3		
<b>Silver coated prosthesis (n=43)</b>			0.218	
Yes	8	1		
No	35	7		

123 \*MRSA/MRSE: methicillin resistant staphylococcus aureus, methicillin resistant staphylococcus epidermidis; p  
 124 value: <0.05 as significant on univariate analysis, CI: confidence interval

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