ORTHOPAEDIC METAL IMPLANT COATED WITH SILVER IN A NEW ZEALAND WHITE RABBIT MODEL: MICRO-CT ASSESSMENT

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INTRODUCTION:

Implant related infections poses major challenges in orthopaedic surgery. The contamination during implant placement may lead to infection. The infection risks may be overcome by application of orthopaedic metallic implant coated with silver composite (OMICS) as alternative treatment of implant-infection related. The objective of this study is analyze potential of OMICS through micro-CT evaluation.

METHODS:

A total of 16 New Zealand White rabbits were implanted with OMICS (N=8) or non-coated implants (N=8) after six hours of tibial bone exposure in open fracture model. The evaluation was done at 3 and 6 weeks of intervals to look at infected area and bone analysis by micro-CT (Bruker®, Skyscan 1176). The samples were scanned using voltage (90Kv), Current (212µA), exposure time (80ms), filter (1mm of aluminium) and 18µm pixel resolutions. The outcome evaluations were analysed through the NRecon® and CTan® software's. The SPSS (Statistical Package for the Social Sciences) version 21 was used to evaluate the results by using simple pair t-test with 0.05 alpha level (α=0.05).

RESULTS:

Micro-CT analyser revealed that there is no significant difference between OMICS and non-coated groups ($p>0.05$) at 3 and 6 weeks of intervals as showed in Table 1. This result demonstrated that OMICS implant is comparable with non-coated implant in promoting bone healing.

DISCUSSIONS:

Implant related with infections poses major challenges in orthopaedic surgery. Coating technology on implant surfaces is an option of orthopaedic implant to reduce infection during implantation. Micro-CT outcome showed that it can support bone healing. The coating technology of OMICS is comparable, effective, and become an alternative option as implanted medical device for orthopaedic patients.

Table 1: Illustrated Micro-CT outcome in both implants

Study Interval	Test parameter	OMICS Implant	Non-coated Implant	p. Value
3 Weeks	Tissue Volume (mm^3)	714.342	674.982	0.759
	Bone Volume (mm3)	138.346	132.796	0.487
	Bone Surface (mm3)	1654.658	1432.923	0.432
	Trabecular Thickness (mm)	0.976	0.883	0.543
	Bone Mineral Density (%)	82.54	75,53	0.923
6 Weeks	Tissue Volume (mm^3)	758.403	679.483	0.789
	Bone Volume (mm3)	145.987	143.042	0.522
	Bone Surface (mm3)	1690.754	1648.989	0.470
	Trabecular Thickness (mm)	0.976	0.936	0.587
	Bone Mineral Density (%)	86.80	81.50	0.975

CONCLUSION:

In summary, coating technology through orthopaedic metallic implant coated with silver composite (OMICS) implant is suggested to be applied as an implanted device to prevent infection during implant placement in future.

REFERENCES:

1 Kuehl et. al. Antimicrobial Agents and Chemotheraphy 2016;60(4):2467-2575.
2. Moriarty et. al. EFFORT Open Rev 2016; 1:89-99.
3. Yichi Xu et. al. Experimental and Therapeutic Medicine 2018; 15:90-102.