Hong Kong Journal of Orthopaedic Surgery

Abstracts of
The 27th Annual Congress of the Hong Kong Orthopaedic Association

17-18 November 2007

2007 Vol. 11 Supplement
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8.5

Should We Collect Femoral Head for Allogenic Bone Grafting? From a Financial Consideration

Leung HB

Department of Orthopaedics and Traumatology, Queen Mary Hospital, Hong Kong

Introduction: Bone graft is needed in various conditions. Although autograft is the gold standard, it is of limited supply and carries complications on harvesting. Allograft eliminates these complications but carries other risks like infection transmissions, less favourable incorporation and mechanical property. It also requires a well kept bone bank for a safe logistic. This study reviewed the cost effectiveness of procuring femoral head and compared to the commercially available bone substitute.

Methods: Record of a musculoskeletal tissue bank in Hong Kong was retrieved for the period of 1997 to 2006. Direct cost of femoral head procurement was calculated. Cost effectiveness of utilising bone harvested in form of femoral head was evaluated.

Results: 528 donors contributed 534 femoral heads in the period. For every femoral head eligible for transplant, the direct cost would be around HK$7352. Each gram of transplantable allogenic bone costs around HK$300.

Discussion and Conclusion: Given the cost of commercially available bone substitute was cheaper than the cost of harvesting femoral head, and the biomechanical property were more consistent in these products, running a bone bank solely for procuring femoral head was not found to be cost effective, even when the indirect cost was not considered.

8.6

Nitrogen Plasma Modified Nickel Titanium Alloy for Orthopaedic Implantation: Long-term In Vivo Study

Lam KO,¹ Yeung KWK,¹ Chan YL,¹ Wu SL,² Liu XM,² Chung CY,² Chu PK,² Chan D,² Luk KDK,¹ Cheung KMC¹

¹Division of Spine Surgery, Department of Orthopaedics and Traumatology, Queen Mary Hospital, The University of Hong Kong, Hong Kong, ²Department of Physics and Materials Science, City University of Hong Kong, Hong Kong, and ³Department of Biochemistry, Faculty of Medicine, The University of Hong Kong, Hong Kong

Introduction: Nickel titanium (NiTi) alloy is a very potential implantable material, since it has super-elasticity and shape memory effect. However, its high nickel content is potentially induced toxicity in vivo if permanently implanted. Therefore, an effective method to inhibit nickel ion release is essential to the success of long-term implantation. We have therefore proposed to use nitrogen plasma immersion ion implantation (N2-PIII) to mitigate the nickel ion release and increase the bioactivity.

Methods: In vitro study, all treated and untreated samples were immersed in simulated body fluid for 3 months and 12 months. The released nickel ions were extracted and measured by using inductively coupled plasma mass spectrometry (ICP-MS). The extracted solutions were also used in cytotoxicity testing by using MC3T3-E1 mouse osteoblast culture. In vivo study, the samples were implanted into rabbit’s femur and iliac crest for 6 and 12 months. The implanted tissues were harvested at each time point. The new bone formation was observed by giemsa-eosin staining.

Results: The ICP-MS results suggest the nickel ion release has been stabilised after 12 months. The amount of released Ni ion is tiny at untreated and treated samples. By in vitro testing, the released amount does not induce any toxic effect to cells. In vivo study, new bone formation of treated sample is, however, superior to the untreated one at every time point. This enhanced bioactivity can attribute to the nitrogen plasma treated surface layer.

Discussion and Conclusion: This study demonstrates the nitrogen plasma treated NiTi is feasible for long-term surgical implantation.