

**UNIVERSITI TEKNOLOGI MARA**

**VANCOMYCIN-LOADED BONE  
CEMENT USED IN ARTHROPLASTY  
IN FIVE MALAYSIAN  
GOVERNMENT HOSPITALS**

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## ABSTRACT

Despite available guidelines on antibiotic prophylaxis for arthroplasty, there is currently no universally defined guideline on the best pharmacological agent for prosthetic joint infection treatment. This research was conducted to investigate the prophylactic antibiotics used in arthroplasty; to assess the clinical practice of antibiotic-loaded bone cement among healthcare practitioners and compare the strength and formulation of vancomycin-loaded bone cement in terms of elution properties and antibacterial activity. A retrospective cross-sectional study in patients who underwent arthroplasty from 2008 until 2015. Only 930 records out of 1,122 were retrieved. Almost all patients (94.6%) received IV ceftriaxone given as 1g or 2g as prophylactic antibiotic. A total of 873 patients (93.9%) were also given IV amoxicillin/clavulanic acid 1.2 g as antibiotic irrigation at the wound site after the implant insertion before wound closing. The practice of antibiotic-loaded bone cement was investigated among the orthopaedic surgeons, medical officers, house officers in five tertiary government hospitals. The practice of antibiotic-loaded bone cement was investigated among the orthopaedic surgeons, medical officers, house officers in five tertiary government hospitals. There were statistically significant findings between the designation and working experience versus knowledge and experience handling ALBC. The antibacterial ability and elution properties were also compared among the different preparation and concentration of vancomycin-loaded bone cement against the methicillin-resistant *Staphylococcus aureus* (MRSA) using disc diffusion method and high-performance liquid chromatography (HPLC). No differences were observed in the zone of inhibition between the amount of vancomycin and in the preparation of bone cement itself ( $p>0.05$ ). The addition of vancomycin powder before or after the addition of monomer showed no difference in terms of antibacterial activity ( $p>0.05$ ). The elution of vancomycin showed a burst during the first hour on the first day that for a few days and reached plateau after 72 hours. As conclusion, overall guideline adherence rate was 5.4% only. The practice of ALBC among orthopaedic surgeons differ in terms of antibiotic choices and doses used. Dose of 2 g vancomycin can be manually added into the bone cement to achieve antibacterial activity and eluted concentration needed in treating methicillin-resistant *Staphylococcus aureus* (MRSA) infection.

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# CHAPTER ONE

## INTRODUCTION

### 1.1 Research Background

Arthroplasty or total joint replacement surgery is one of the most successful procedures performed today. Prosthetic joint infection or PJI after arthroplasty is the most debilitating complications. Although the incidence of infection after arthroplasty is very low between 0.5% and 3%, it can increase the healthcare cost and morbidity to the patient and in some cases, it can lead to death. The incidence of PJI or periprosthetic infection increases with the increased number of arthroplasty done (Huotari et al., 2010).

Antibiotic prophylaxis is given before surgery to reduce the incidence of surgical site infection such as PJI. The American Society of Hospital Pharmacist for Surgical Prophylaxis Guideline and Malaysia National Antibiotic Guideline 2019 suggested IV cefazolin to be given as prophylaxis in total joint replacement surgery (Bratzler et al., 2013; Marculescu & Osmon, 2005). A systematic review on the continuation of prophylaxis after arthroplasty also shown no extra benefit (Siddiqi et al., 2019). Despite many studies and clinical trials are being performed to improve the results of treatments, there is still lack of guideline or evidence for medical action, with consequent non-optimal and precise treatment regarding prosthetic joint infections. For example, in the latest Malaysia National Antibiotic Guideline 2019 there is no mention of antibiotic-loaded bone cement in the treatment of prosthetic joint infection. Although the use of antibiotic-loaded bone cement has been established, it seems that the practice of using it has been controversial over its safety and the exact mechanism of how the antibiotics affect the bone cement. There has also been concerns on the risk of systemic toxicity or allergic reaction to antibiotic-loaded bone cement. This is coupled with the development of antimicrobial resistance towards the antibiotics with the widespread use of antibiotic-loaded bone cement (Martínez-moreno et al., 2017).