

## Intra-operative antibiotic bead maker – point of technique

T.O. Alonge\* and A. Wale†

\*Department of Surgery, University College Hospital, Ibadan, Nigeria.

†Department of Engineering, Leicester University, Leicester, U.K.

### Summary

Chronic osteomyelitis is a disease of soft tissue and bone and it is common in the developing countries. The management of this debilitating disease requires the delivery of the appropriate chemotherapeutic agent at the site of the infection after adequate debridement. The search for a suitable carrier for these chemotherapeutic agents is the advent of the 'septopal' or gentamycin-polymethylmethacrylate (gentamycin-PMMA) beads. Septopal beads are expensive and are not affordable by patients in the developing countries. Moreover, most of the micro-organisms (mixed flora) responsible for chronic osteomyelitis in our hospitals are sensitive to ceftriaxone and only in a few cases were gentamycin-sensitive micro-organisms isolated. Therefore, it was imperative that patient-specific and antibiotic-specific PMMA beads would be the way forward and this is the reasoning behind the production of the intra-operative antibiotic bead maker (IABM) and the point of technique is hereby presented.

**Keywords:** antibiotic bead, drug delivery system, intra-operative antibiotic bead maker.

### Résumé

L'Osteomyelite chronique, est une maladie des os et des tissus moue et est une maladie tres frequente dans les pays sous developes. Le traitement de cette maladie demande l'administration de medicament ou d' agent chimiotherapeutique appropie au site de l'infection apres un nettoyage adequat. La recherche du porteur adequat de co agents chi-miotherapeutiques est l'arrive de "Septopal" ou gentamycine - polymethylmethacrylate (gentamycine - PMMA) en gouttes. les gouttes de Septopal sont tres chers et par consequent pas accessibles and patients des pays rous-developes envete de development. La plupart des microorganismes responsable de l'osteomyelite chronique dans nos hopitau sont sensible au ceftriaxone et senlement dans peu de cas its sont sensible a la gentamycine. Parconsequent, il etait emperatif aue les patients specific et les antibiotiques specific PMMA gouttes soit la solution et cela est le raisonnement sous la production de intraoperative des antibiotiques a gouttes la techniques de point est ainsi presentee.

### Introduction

Chronic osteomyelitis is a debilitating disease which is common in developing countries most especially in patients with sickle cell anaemia and other haemoglobinopathies which are prevalent in the tropics [1,2]. Chronic osteomyelitis may be primary or secondary and various management strategies have been employed to tackle this disease entity. These treatment modalities include, among others: (a) prolonged antibiotic therapy (with its attendant adverse effects) [3], (b) the staged Papineau technique [4], (c) augmentation of the Papineau technique with the addition of continuous antibiotic irrigation

[5] and (d) debridement and filling of the resultant bone cavity with (i) antibiotic impregnated bone substitutes [6], (ii) antibiotic impregnated polymethylmethacrylate (PMMA) bone cement [7, 8] and (iii) antibiotic impregnated bio-degradable polyactic-co-glycolic acid copolymer (PLGA) [9]. Debridement of the osteomyelitic cavity prior to any other form of intervention has become mandatory. This is because the offending bacteria that are trapped in the avascular dead bone or in the cancellous dead spaces by fibrin clot are protected both from the body's defence mechanism and from the attendant chemotherapeutic agent(s) [10]. This barrier is further reinforced by the dense scar tissue. [11].

The use of a delivery medium for the antibiotic of choice, for example, PMMA or collagen sponges, enables a high concentration of the drugs to be delivered at the implanted site thereby reducing any toxic or adverse effects [7]. However, to achieve the localised high antibiotic levels, primary wound closure is mandatory and this is the principle behind the staged Belfast technique [12]. In the developing countries, the cost of procurement of the antibiotic laden PMMA beads is enormous and not affordable by majority of patients. However, in our practice, most of the micro-organisms isolated from the wound swabs of patients with chronic osteomyelitis were not sensitive to gentamycin which is the commonest commercially available antibiotic-PMMA beads. As such an alternative patient specific antibiotic bead system has been developed; the intra-operative antibiotic bead master (IABM).

### Point of technique

The antibiotic bead maker consists of two identical stainless steel slabs with two rows of wells (Figure 1). The wells in each row are joined together by a narrow trough running through the entire length of the blocks. The IABM is assembled by inserting four screws in the lower block at the termination of the troughs, wire sutures are then attached to the screws and these are threaded through the troughs under tension to avoid sagging. The dose of the chosen antibiotic is calculated and mixed with plain PMMA. Using a syringe, the wells of the lower block are filled with liberal quantities of the mixture.

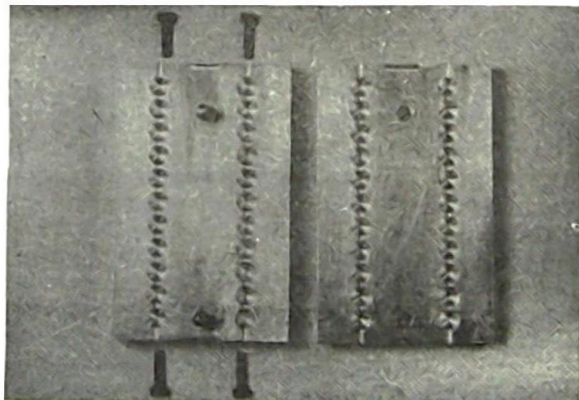


Fig. 1 - Intra-operative antibiotic bead maker (IABM) (dismantled)



The upper block is then fitted onto the lower block (with the holes of the upper block accommodating the pegs of the lower block so that the corresponding wells of the two blocks are apposed) (Figure 2). PMMA-antibiotic mixture is allowed to set and thereafter, the two blocks are separated. The antibiotic-specific PMMA-bead chain produced (Figure 3) is now detached from the screw heads, tidied and are ready for use. Using this technique, as many beads as is needed can be made for the chosen antibiotic(s) and the total cost is considerably less and it is affordable compared to the cost of the commercially available antibiotic-PMMA beads.

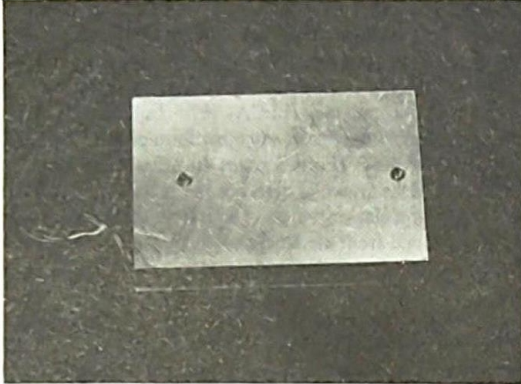


Fig. 2: The two slabs of IABM assembled.

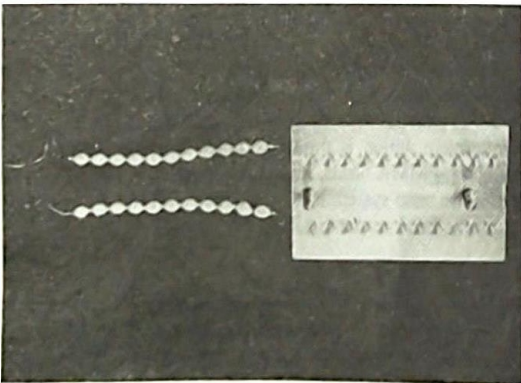


Fig. 3 – Antibiotic-specific PMMA beads still attached to the screw heads.

#### Conclusion

The IABM is portable and offers the surgeon a choice of antibiotic-specific PMMA-beads for each individual patient. It also offers the surgeon the opportunity to make as many beads as is required in the prevailing circumstances encountered intra-operatively. In developing countries, economic constraints have a significant impact on the delivery of health care. It is hoped

that this simple tool will be very handy to the orthopaedic, plastic and even general surgeons who have to cope with or are involved in the management of chronic osteomyelitis or indeed chronic septic cavities where high local antibiotic concentration is desired.

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