

# Antibiotic Loaded Bone Cement in Orthopaedic Surgery

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Antibiotic loaded bone cement (ALBC) is used for prevention as well as treatment of orthopaedic infections. Below is a short review of salient points and practical tips regarding antibiotic loaded cement

## 1. Antibiotics which can be used

### i. Gram positive coverage

- a. Vancomycin
- b. Cefazolin
- c. Clindamycin
- d. Teicoplanin
- e. Daptomycin

### ii. Gram negative coverage

- a. Gentamycin
- b. Tobramycin
- c. Colistin
- d. Tigecycline
- e. Meropenem

## 2. Antibiotic must be

- a. Water soluble
- b. Powder form
- c. Stable at temperatures up to 60 to 80 degrees Celsius.

## 3. Effect of type of mixing

### a. Manual:

More porous  
Less mechanical stability  
Higher chance of mantle fracture  
Better elution of antibiotics due to high porosity

### b. Vacuum mixing

Less porous  
More stable  
Less elution of antibiotics compared to manual preparation (not clinically significant)

## 4. Combination of two antibiotics

in a spacer has a superior bactericidal activity and the antimicrobial effect lasts for a longer duration as compared to a spacer loaded with a single antibiotic [1]. This occurs due to enhanced elution of both the antibiotics, a phenomenon described as "passive opportunism" Coupling of a glycopeptides and aminoglycoside covers both gram positive and gram negative organisms thereby reducing the resistance rates.

The combination of teicoplanin with gentamycin is more superior than Vancomycin with gentamycin

## 5. Amount of antibiotic

- a. Must not exceed 10% of the total volume of cement
- b. Higher than 10 % may affect the mechanical strength of the cement mantle in arthroplasty
- c. Higher concentration of antibiotics can be used if PMMA is used as a temporary spacer
- d. Primary arthroplasty: Mix less than

2 grams of antibiotics with 40 grams of PMMA.

e. Temporary spacer in trauma or periprosthetic infections > 2grams (up to 6 to 8 grams) of antibiotic can be used with 40 grams of PMMA [2,3].

## 5. Biomechanical properties:

Studies show that addition of antibiotics to the commonly used brands (Simplex, Palacos, CMW1 and CMW 3) did not show any significant difference in the fatigue strength as compared to the same brand without any antibiotic [3]. Clinically significant differences in biomechanical properties are seen only when high doses of >4.5gm per 40gms PMMA are used

## 6. Tips and tricks to prepare cement beads [4]

- a. 22 or 24 gauge stainless steel wire is braided by holding a loop with clamps at either ends and twisting it.
- b. Bead size must not exceed 8mm
- c. Keep a gap between 2 successive beads
- d. Surface area of the beads can be increased by making multiple pits on the surface using a 1.5mm k wire as the PMMA starts to set
- e. Suction drain if used may be kept

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closed and opened every 6 to 8 hours for only 15 minutes to allow periodic drainage of the wound

### 7. Cement mixing recommendation

A. Sumant Samuel et al [4]

- a. Add liquid monomer to methylmethacrylate powder in a bowl
- b. Commence hand mixing with a spatula
- c. Add appropriate amount of antibiotic powder to the cement when in early 'dough' phase immediately

after wetting the cement

- d. Mix in standard fashion at 1 revolution/ second to obtain a homogenous compound

B. Oschner et al [5]

- a. Fill bowl with appropriate amount of antibiotic powder (eg. 2 grams)
- b. Grind to a fine powder
- c. Mix equal amount of cement polymer powder (2 grams) to the bowl
- d. Mix thoroughly
- e. Add an equal amount of cement

- polymer powder subsequently so as to double the total amount in the bowl till all the polymer powder is used up
- f. Pour liquid monomer
- g. Blend as usual

Careful attention has to be paid to dose and method of mixing for preparation of antibiotic loaded cement. It is an effective tool when used properly for proper indications

## References

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