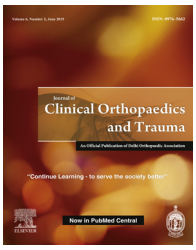
Available online at www.sciencedirect.com

ScienceDirect

journal homepage: www.elsevier.com/locate/jcot



Technical Tip

Novel modification of second generation intramedullary PMMA cementing technique for narrow upper and lower extremity canals

Manit K. Gundavda M.B.B.S. [a,*], *Prakash Nayak M.S. Orth.* [b], *Manish G. Agarwal M.S. Orth.* [c]

[a] *Resident, Department of Orthopaedics, Hinduja National Hospital and MRC, Mahim, Mumbai, India*
[b] *Fellow in Musculoskeletal Oncology at Mount Sinai Hospital, Toronto, Canada*
[c] *Consultant Orthopaedic Oncologist, Department of Orthopaedics, Hinduja National Hospital and MRC, Mahim, Mumbai, India*

ARTICLE INFO

Article history:
Received 17 July 2015
Accepted 15 August 2015
Available online 16 September 2015

Keywords:
Narrow intramedullary canals
Second generation cementing
Technique modification

ABSTRACT

Purpose: It is very difficult to cement intramedullary canals smaller than 10 mm with standard commercially available cement syringes due to mismatch in canal and syringe diameters. This is often encountered in children and in the upper limb. We describe a simple method of cementing, using cement gun with size-matched plastic endotracheal tube (ET).
Methods: The medullary canal is prepared and the size determined. ET with outer diameter 0.5–1 mm smaller than the canal diameter is chosen. The standard cementing syringe nozzle is cut at the middle and fitted to Portex® tube with the adaptor connector, which comes with the ET. The plastic ET is cut to an appropriate length depending on canal length to be cemented. The nozzle is fitted to the syringe and cementing done in the usual way. We applied this new modification in the method to cement narrow canals of ulna, humerus, tibia and femur.
Results: The method has proven to be consistently reliable and useful in cases of cementing stems into bones with narrow intramedullary diameters. Apart from femur and tibia in children, humerus and ulna in adults were also cemented. The cement mantle by this technique is uniform and uninterrupted. Special care should be taken to fit the connector properly to the syringe nozzle and to hold it firmly while cementing.
Conclusions: In our experience, this new technique has proven to be very useful, easy to use, reproducible and effective in cementing narrow canals.

* *Corresponding author*. Resident at Department of Orthopedics, P.D. Hinduja National Hospital and Medical Research Centre, Veer Savarkar Marg, Mahim, Mumbai 400016, Maharashtra, India. Tel.: +91 9920050727.
E-mail address: manit.gundavda@gmail.com (M.K. Gundavda).
http://dx.doi.org/10.1016/j.jcot.2015.08.006

1. Introduction

With the evolution of cementing technique, retrograde high pressure cementing with a gun has shown to improve the quality of cement mantle and delay loosening.[1] Commercially available cement guns have pre-sized disposable nozzles, which have a diameter of 12 mm at the narrowest taper and 14–15 mm at the proximal end. This is unsuitable for narrower canals encountered in children and the forearm bones, as well as lower limb bones in the Asian population. Lack of options may force surgeons to choose inferior methods like thumb packing/pouring the cement in its liquid form, which can significantly compromise bonding interface and impact longevity of the construct.[2,3]

We describe a novel modification to the existing second generation technique of cementing, which allows cement filling in narrow intramedullary canals of virtually all sizes ranging from 3 mm to 12 mm inclusive of upper and lower extremities using cement gun with size-matched plastic endotracheal tube (ET).

2. Technique

All patients had prosthesis inserted for reconstruction after resection of bone or joint for a tumour and a canal size less than 13 mm (this is the minimum required with the advantage nozzle). Keeping the above advantages of second generation/contemporary cementing techniques in mind, the focus of our technique was to improve cementing in narrow intramedullary canals and in the absence of appropriately sized nozzles for the Indian population as explained above.

The technique exploits the universal availability of all sizes of ET in every operating theatre.

The first step is to fetch a tube where the outer diameter (OD) matches closest to the canal diameter after satisfactory reaming to allow the ET to comfortably slide into the canal [Fig. 1], e.g., if the ulna canal is reamed to allow a 4 mm

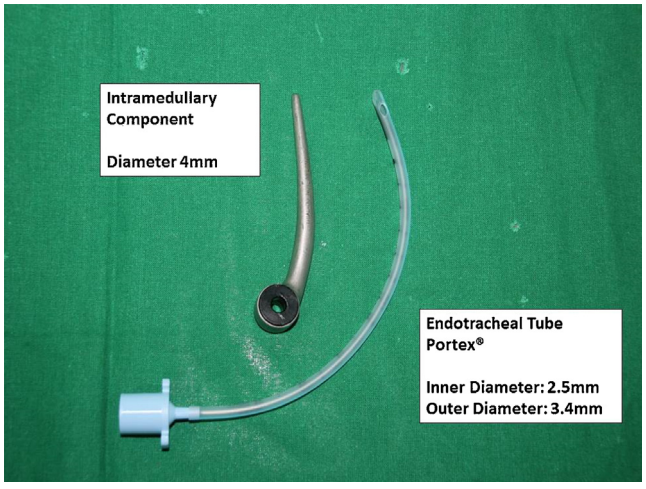


Fig. 1 – Endotracheal tube with OD smaller than prepared/reamed canal diameter.

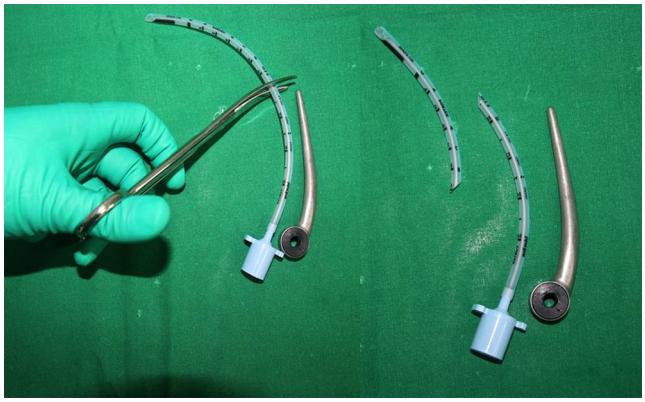


Fig. 2 – Cut endotracheal tube to desired length, to allow retrograde cementing.

component to fit, an ET with an OD of 3.9 mm or slightly lesser could be used.

The next step is to cut the cuff and trim the length to suit the length of the stem to be inserted [Fig. 2]. If the stem length is 8 cm, a 1–2 cm margin of cement plug (restricted by a canal centraliser or cement restrictor where required) demands that the ET be cut at 10 cm from its proximal connector end.

The commercially available nozzle (for example, Advantage nozzle) is cut at 8.5 cm from the shoulder of the nozzle [Fig. 3]. This allows the ET adaptor to fit snugly on to the nozzle so they act as one long passage for the cement. This assembly is fit as usual to the cementing gun and could now be used to inject cement under pressure into the desired canal size [Fig. 4]. The cut is made with a knife blade or with a saw. The loose plastic particles are removed by wiping with wet gauze.

The advantage lies in the fact that even a 4 mm ulnar canal could be cemented under pressure by adapting a 3.5 or a 3.9 OD ET to the native nozzle. The snugness of the fit ensures that the assembly does not disengage while cementing under pressure. For any other system, it is possible to work out where the nozzle should be cut to obtain a tight fit with the adaptor.

Downsized ET diameter allows entry well into the intramedullary canal up to desired thereby allowing retrograde cementing, and also the flexibility of the ET, which tends to align itself in the intramedullary canal – allows cementing without having to be perfectly in line with the intramedullary canal (Fig. 5) – which are the key highlights of the cementing technique using ET.

Table 1 lists the various sizes of Portex® endotracheal tubes available with their respective OD as a ready reckoner for use. If a different manufacturer were used, the only change would be the distance from the shoulder where the native nozzle is cut so as to allow a snug adaptation with the ET.

The bone was thoroughly cleaned before cement insertion, in most cases using a pulsatile lavage, an intramedullary centraliser plug was used where advocated, and canal packed with roller gauze until we were ready to cement the canal. The cement was inserted retrograde to reduce blood lamination and voids. Because of high resistance, the cement was injected