Commentary: Vascularized bone graft is an effective technique for extra-cortical bone bridging to combat cemented megaprosthesis loosening at the bone–implant junction

Megaprosthesis is a commonly used for reconstruction in limb salvage surgery after tumor resection or as salvage for failed arthroplasty with extensive bone loss. Despite being a practical device they can undergo failure. Henderson et al.\(^1\) has classified endoprosthesis failures into five types, with aseptic loosening classified as type 2 failure. In his review of 2174 cases, there were a total of 534 failures, out of which 19% were type 2 failures. The highest amount of failures was in the distal femur endoprosthesis group, with the rate being higher in simple hinge joints as compared to polyaxial joints. This is because polyaxial joints have both the hinge and rotating motion, thus reducing torsional forces at the bone–implant junction.

These implants are fixed to the bone by either cementation or uncemented (press-fit) techniques. For cemented prosthesis, the primary bond between the implant and bone is achieved by cementation. However, definitive fixation develops over time with boney ingrowth and ongrowth over the implant between the bone and implant. To encourage this bonding, a porous or hydroxyapatite collar is usually used.

Coathup et al.\(^2\) studied the use of hydroxyapatite (HA) coated collar in primary distal femur endoprosthesis replacements. They reviewed 61 patients with a mean follow-up of 8.5 years. They reported an aseptic loosening rate of 8%, which is much lower than similar series of distal femur endoprosthesis without the use of HA coated collar.\(^3,4\) The use of HA coated collar, allows for osteointegration between the implant and host bone. Thus, providing long-term fixation and bonding. Michael Tanzer\(^5\) analyzed extra-cortical bone ingrowth in five endoprosthesis that were removed for various reasons and studied the quality of bone ingrowth into the porous coating microscopically. They discovered that although radiologically there is extra-cortical bone extension into the porous coating but, histologically there in no ingrowth into the porous coating. This osteointegration can be enhanced by bone grafting of the implant host bone junction as shown by Petri Virolainen et al.\(^6\) in canine models.

In a paper by Luk et al.,\(^7\) he reviewed 46 surgeries, where 28 cases of bone grafting at the bone-implant junction were performed and 18 cases did not. Out of which 13 cases had vascularized bone grafts (VBG) and 15 had non-vascularized bone grafts (NVBG). They found a loosening rate of 27.8% in the non-bone graft group vs. no loosening in the bone graft group. The vascularized bone grafting group showed better radiological scoring of bone formation at 6 months and 12 months and lower rate of radiological junctional resorption compared to the non-vascularized bone graft group. They used the proximal end of the host bone as source of the VBG, which is ingenious, as it does not create donor site morbidity. However, this technique may not be feasible for long segment resections where the remaining host bone maybe just adequate length to accommodate the implant stem. In such cases, the surgeon might have to resort to using NVBG.

Currently, there is interest in the use of tantalum (trabecular metal) endoprosthesis to encourage osteointegration and soft tissue ingrowth. As it is new, there is only a small series of data but it shows promising results.\(^8\) To sum it all, the best method of ensuring a good implant bone interface bonding in cemented implants to date, is to use a HA collar with extra-cortical bone grafting, preferably VBG.

Vivek Ajit Singh
University Malaya, Kuala Lumpur, Malaysia
Email: drvivek69@gmail.com

OCRID iD
Vivek Ajit Singh \(\oplus\) https://orcid.org/0000-0001-8899-9266

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