

Utilization of the Tobra Bone Basket for Reduced Allograft Use and Decreased Cost in TLIF Surgeries

Jennifer A. Bowden¹, Jake Reed¹, Seth Wilson¹, Kai Barlow¹, John R. Edwards¹

¹Summit Brain, Spine and Orthopedics, Lehi UT

Jenniferb@summitbrainandspine.com

Disclosures: none

INTRODUCTION: Bone graft material is a key component for successful fusion treatment of lumbar and cervical spinal degenerative diseases. Autologous bone is considered the gold standard for bone healing, regeneration, and spinal fusion procedures.¹ To acquire sufficient bone material, iliac crest bone grafts are utilized, but there are frequent complications following iliac crest harvest. Due to difficulties in obtaining sufficient bone, and to avoid complications with iliac crest bone grafts, alternative graft materials are often utilized either alone or in combination. These include allograft cadaver bone, recombinant human bone morphogenic proteins, hydroxyapatite, β -tricalcium phosphate, demineralized bone matrix, bone marrow aspirate, silicate calcium phosphate, and platelet rich plasma. Local morselized bone autograft (LMBA) utilizes the bone from the surgical site that is removed for surgical repair and hardware placement. LMBA effectively provides the osteogenic, osteoinductive, and osteoconductive properties necessary for successful spinal fusion; thus, LMBA has also been demonstrated to be a cost-effective bone graft option, as the amount of allograft or other graft materials necessary is reduced.² A primary challenge in utilizing LMBA is the ability to collect an adequate amount for appropriately filling the interbody cage and disc space. Frequently, surgeons who use LMBA will utilize a combination of autograft and allograft due to this challenge. A minimally invasive, transforaminal lumbar interbody fusion (TLIF) is a procedure performed frequently by the senior author (JRE) and allowed an opportunity to evaluate allograft and autograft needs with an appropriate sample size. Our objective was to quantify the impact of utilizing a Tobra Bone Basket (TBB) in comparison to a standard bone mill (mill) for autograft collection. The TBB utilizes suction to effectively collect the morselized bone removed from the surgical site, rather than relying on manual collection into a bone mill. We hypothesized the basket more effectively collects the morselized bone to the degree that for the majority of patients, sufficient LMBA is collected to meet full bone graft needs and eliminate the need for additional allograft, thus resulting in an effective graft with a substantial cost savings.

METHODS: In an Institutional Review Board approved retrospective review of the electronic medical records, we evaluated operative reports for 200 sequential patients from one surgeon (JRE) receiving a TLIF from 4/9/2021-5/18/2022. Surgeries performed prior to 11/10/2021 utilized a bone mill (Stryker) while surgeries performed after that date utilized the TBB. Descriptive statistics were utilized for comparisons between groups. Records were examined for basic demographic information, verification of TLIF surgery, and allograft and/or autograft use. Cost comparison data were limited to the direct costs related to graft materials rather than the entirety of surgical costs and were standardized to avoid bias from potential price point changes.

RESULTS: The 200 patients examined had an average age of 58.6 years, with 106 females. The mill group (n= 96, average age 56.7, 52 female) almost exclusively required the use of both LMBA and allograft (both n=89, 92.7%; LMBA only n=7, 7.3%). The TBB group (n=104, average age 60.3, 54 female) predominantly only utilized autograft (both n=20, 19.2%; LMBA only n=84, 80.7%) demonstrating the effectiveness of the TBB in collecting adequate morselized bone. None of the procedures in either group utilized allograft exclusively. The majority of the procedures were single level fusions (n=182). In examining graft related costs, for the surgeries performed prior to 11/10/2021 a bone mill (\$400) was needed along with 5cc of allograft (\$450) for the patients requiring both allograft and LMBA. When use of the TBB (\$180) was initiated, that cost displaced the cost of the bone mill. The cost reduction from the initial \$850 when utilizing the bone mill, allograft and LMBA decreases to \$180 for the TBB and LMBA results in a 78.8% savings in graft costs (\$670) and represents approximately 80% of cases. For the series of cases examined, there was an overall average cost of \$817 in the bone mill group, compared to \$267 in the TBB group. Overall cost savings between groups is \$550 for a per patient average with a total cost savings of over \$57,000 for the group using the TBB, averaging a 67% savings in graft related costs for the study period. When compared to a procedure that only utilized allograft, calculating cost based on an average graft volume need of 10 cc and no bone mill or TBB used would indicate a total graft cost of \$950, with a savings of \$770 or 81% by using LMBA and the TBB. Savings when using the bone mill, with additional allograft compared to all allograft is much smaller (\$100, 9.5%)

DISCUSSION: For the cases evaluated, changing practice to utilize the TBB in TLIF surgeries provides a cost-effective way to utilize LMBA with greatly reduced need for additional allograft material. In other cost analyses, comparisons have been made using LMBA as an extender, rather than the sole graft material, with a significant savings noted.² This savings to patient costs, along with the benefits of utilizing LMBA provide strong support for continued utilization of this device. Further long-term outcome data would be beneficial in evaluating the procedural change, is a limitation in this study, and is forthcoming.

SIGNIFICANCE/CLINICAL RELEVANCE: Utilizing available tools such as the Tobra Bone Basket allows exclusive use of local autograft for patients undergoing TLIF while also providing a substantial savings in graft related costs.

REFERENCES: 1. Salamanna, F. *et al.* Spinal fusion procedures in the adult and young population: a systematic review on allogenic bone and synthetic grafts when compared to autologous bone. *J Mater Sci Mater Medicine* 31, 51 (2020).
2. Halalmeh, D. R. & Perez-Cruet, M. J. Use of Local Morselized Bone Autograft in Minimally Invasive Transforaminal Lumbar Interbody Fusion: Cost Analysis. *World Neurosurg* 146, e544–e554 (2021).

ACKNOWLEDGMENTS: We would like to thank Scott Parry for price lists and intraoperative images. No external funding was associated with this project.

