

Local steroids and dysphagia in anterior cervical discectomy and fusion—does the employment of rhBMP-2 make their use a necessity?

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Submitted Aug 09, 2016. Accepted for publication Aug 12, 2016.

doi: 10.21037/jss.2016.08.02

View this article at: <http://dx.doi.org/10.21037/jss.2016.08.02>

Dysphagia consists one of the most disturbing postoperative symptoms, with reported incidence varying from 1% to approximately 80% of patients undergoing anterior cervical procedures (1). It is also known that despite the high reported rates of early postoperative dysphagia, it has been demonstrated that less than 15% of the patients will finally experience dysphagia one year after surgery (2). Generally, dysphagia is characterized as difficulty in the swallowing process, and it may affect the consumption of both solid food and/or liquids. Many factors have been implicated in the genesis of postoperative dysphagia, such as previous neck surgery, prolonged operative time, multi-level procedure, excessive intraoperative esophageal retraction, employment of rhBMP-2, implantation of anterior cervical plate, and postoperative development of prevertebral soft tissue edema.

Indeed, the role of the human bone morphogenetic proteins, such as rhBMP-2, in the emergence of dysphagia has been adequately documented in the literature. Tannoury *et al.* in their literature review evaluating the adverse events and complications associated with the use of rhBMP-2 in spinal procedures, identified the implication of rhBMP-2 in the development of postoperative neck soft tissue swelling and dysphagia (3). Smucker *et al.* in their study demonstrated the association of rhBMP-2 in the postoperative development of prevertebral soft tissue edema in anterior cervical procedures with fusion (4). Similarly, Vaidya *et al.* showed that rhBMP-2 was associated with dysphagia, and increased incidence of postoperative soft tissue swelling (5). Mroz *et al.*, in their systematic review regarding the side effects of BMPs in spine fusion surgery,

identified dysphagia as one of the most important side effects (6). Fu *et al.* concluded that rhBMP-2 was strongly associated with dysphagia development in anterior cervical procedures (7). Likewise, Burkus *et al.* reached the conclusion that dysphagia was significantly higher among patients receiving BMP (8). Lu *et al.* reported that although the overall incidence of dysphagia was not affected by the employment of rhBMP-2, its severity was associated with the usage of rhBMP-2, in their study (9).

The well documented effect of BMP in facilitating osseous fusion led to the employment of lower doses, in an effort to decrease the incidence of the associated soft tissue swelling and dysphagia. Stachniak *et al.* reported that only 6.7% of their patients had persistent dysphagia with low dose rhBMP-2, 6 months after their procedure (10). Similarly, Kukreja *et al.* reported lower incidence of postoperative dysphagia with lower rhBMP-2 doses (11). Pourtaheri *et al.* studied the safety and efficacy of a minimum rhBMP-2 dose in three-level ACDF procedures (12). They concluded that the rates of dysphagia in their patients were similar with those of series using no rhBMP-2 (12). Khajavi *et al.* reported similar results by using low-dose rhBMP-2 in multi-level ACDFs (13). Tumialán *et al.* also reported lower incidence of dysphagia with low dose rhBMP-2 in single- and multi-level ACDFs, in their cohort (14). In a recent meta-analysis study, it was demonstrated that a low dose of BMP (0.2–0.6 mg/level) might significantly improve the fusion rates without increasing the incidence of postoperative dysphagia (15).

Steroids have been used in the past for minimizing

the incidence of postoperative dysphagia in patients undergoing ACDFs (16). Lee *et al.* reported decreased postoperative dysphagia and prevertebral soft tissue swelling among patients undergoing ACDFs after applying steroids in the retropharyngeal space (17). They also found that this effect was maintained for at least the first four weeks postoperatively (17). However, the same group of researchers reported delayed esophageal perforation, as a significant adverse event occurring after the local administration of steroids in the retropharyngeal space (18). Koreckij *et al.*, reported their experience from locally applying a saturated collagen sponge with methylprednisolone, in patients undergoing multi-level ACDFs (19). They found that dysphagia was significantly lower among patients receiving steroids, compared to those with no steroids, at six and twelve weeks after surgery. Interestingly, the incidence of postoperative prevertebral soft tissue swelling was reduced immediately after surgery in the steroid group, but showed no difference between the steroid and the placebo groups 12 weeks after surgery (19).

It may be hypothesized that the increased incidence of dysphagia may be associated with the inflammatory effect of BMP, thus local application of steroids could decrease the incidence of dysphagia. Edwards *et al.*, in their current prospective, randomized, double-blinded study employed depomedrol-saturated sponge at the surgical site (ventrally to the implanted anterior plate), while they used a low-dose rhBMP-2 (0.5 mg/level), in order to mitigate the side effect of postoperative dysphagia, and to maintain the rhBMP-2 effect of facilitating the osseous fusion (20). They reported statistically significant decrease in the incidence of dysphagia among the patients receiving steroids compared to the placebo group, who received just saline (20). They also demonstrated that this effect was maintained for at least four weeks postoperatively (20). Although their findings are statistically powerful, the limited number of participants in their cohort makes the performance of a large-scale, prospective study absolutely necessary for confirming their promising results. The long-term effect of steroids in preventing dysphagia should also be assessed in a future study. Moreover, the occurrence of any steroid-associated side effects or complications (increased infection rate, esophageal perforation, surgical wound healing) should be excluded.

Acknowledgements

None.

Footnote

Conflicts of Interest: The authors have no conflicts of interest to declare.

Comment on: Edwards CC 2nd, Dean C, Edwards CC, *et al.* Can Dysphagia Following Anterior Cervical Fusions With rhBMP-2 Be Reduced With Local Depomedrol Application?: A Prospective, Randomized, Placebo-Controlled, Double-Blind Trial. *Spine (Phila Pa 1976)* 2016;41:555-62.

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Cite this article as: Siasios ID, Dimopoulos VG, Fountas KN. Local steroids and dysphagia in anterior cervical discectomy and fusion—does the employment of rhBMP-2 make their use a necessity? *J Spine Surg* 2016;2(3):234-236. doi: 10.21037/jss.2016.08.02