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Commentaries

Brothers-in-arms: Liaison between spine surgeons and plastic surgeons in wound repair after complex spine surgery

Bhavuk Garg, Nishank Mehta*

Department of Orthopaedics, All India Institute of Medical Sciences, Ansari Nagar, New Delhi 110029, India



In NASSJ, Brown and Rubayi have presented an interesting case and discussion of a morbidly obese young female who had midline lumbosacral incisional dehiscence superimposed with infection following lumbopelvic fixation for complex spinopelvic trauma [1]. The authors report a successful outcome in this patient with a sliding musculocutaneous flap overlying the left gluteus maximus muscle.

As we ruminate the details of the presented case, we note the presence of certain risk factors, correctly identified by the authors, that predisposed their patient to postoperative wound complications – the foremost amongst them being morbid obesity. The epidemic of obesity has swept across the United States of America in the last two decades – and is slowly establishing its stranglehold in developing countries as well; a global prevalence study estimated that over one-third of the adult population is either overweight or obese [2].

Obesity adversely affects the surgical outcomes of patients undergoing spine surgery, and has deep-reaching impact on all aspects of a patient's surgical journey including preoperative comorbidities, anesthesia risks, technical challenges for the surgeon and difficulty in postoperative rehabilitation [3,4]. Surgery in these patients is often followed by a tumultuous postoperative course – marked by complications ranging from increased blood transfusion requirements, surgical site infection, thromboembolic disease, postoperative mechanical ventilation, longer operative times and greater need for revision surgery [4]. Surgery in the lumbosacral area was an additional risk factor in this patient – this region is characterized by poor muscle coverage and tends to be the dependent region in recumbency.

The authors have also attributed early mobilization after the index surgery as a likely contributing factor to wound dehiscence in their presented case – however, this is a contentious point since numerous studies have expounded the benefits of early postoperative rehabilitation in patients undergoing spine surgery [5–7]. Given the emphasis placed on early postoperative mobilization in other orthopedic subspecialties, orthopedic surgeons are likely to be primed accordingly – and it is difficult to convince them to delay postoperative mobilization after index surgery by as much as 4 weeks, as the authors imply may be needed in certain cases.

Following surgical debridement of the dehisced wound, the authors were left with a 15 × 15 cm defect, albeit without exposed implants.

At this stage, the management goals for the surgeons were: i) achieving a tension-free wound closure, ii) eliminating the dead space and, iii) augment the local blood supply to facilitate infection control.

The deployment of flaps is the usual solution to such complex reconstructive problems – with local flaps being preferred over free flaps since they require lesser mobilization and replace the defect with similar tissue. The increase in local blood flow is significantly higher after muscle flaps or musculocutaneous flaps, when compared to fasciocutaneous flaps or skin controls [8]. The enhanced blood flow establishes an oxygen-rich environment, actively inhibiting bacterial growth and promoting tissue healing [8]. In the presence of dead space, muscle or musculocutaneous flaps fill up this space, reducing the risk of postoperative seroma, hematoma and local infection.

The options for flap coverage in the lumbosacral area include: superior gluteal artery perforator (SGAP) flap, reverse turnover latissimus dorsi (LD) flap, gluteus muscle turnover flap and a sliding musculocutaneous flap. Shortcomings of perforator-based flaps (SGAP and LD flaps) include limitation of the degree of mobilization by short pedicles and a technically demanding flap harvest [9]. Considering the donor-site morbidity that accompanies muscle flaps, the authors' described technique of raising a musculocutaneous flap appears to be the most prudent amongst the available strategies - this maintains the vascularity, innervation and functional integrity of the gluteus maximus muscle and is less technically demanding [10]. Motor innervation and functional integrity are preserved by limiting dissection to the origin of the muscle. Care should be taken when elevating the gluteal lid to prevent devascularization or injury of the sciatic nerve.

We also pondered over some other important discussion points which would benefit the readers of NASSJ. While it takes intelligence and skill to solve problems, it takes wisdom to anticipate them. Epstein polled 19 spine surgeons, asking them to comment on involving plastic surgeons in primarily or secondarily closing instrumented spine fusion wounds [11]. The responses suggested that there was little precedent for spine surgeons to request the assistance of plastic surgeons in wound closure for spine surgeries. Many spine surgeons harbor the notion of patients undergoing spine surgery as being 'our' patients – and consider it to be their responsibility to close 'our' wounds. In a single-institution review of 928 index cases of spinal surgery where wound closure was done by a plastic surgeon, the authors reported a lower incidence of wound complications compared to large, national database samples [12].

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* Corresponding author.

E-mail address: mehta.nishank@gmail.com (N. Mehta).<https://doi.org/10.1016/j.xnsj.2020.100031>

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There is also limited evidence in support of 'prophylactic' local flap closure of patients undergoing spine surgery [13,14]. Considering the prevalent practice of most orthopedic surgeons and the steep increase in healthcare costs that routine involvement of plastic surgeons in all cases is bound to entail, it is unlikely that the extent of involvement of plastic surgeons in spine surgery will undergo a drastic change. However, it may be pragmatic to identify a subset of patients – based on evidence from literature as well as from personal experience – where 'prophylactic' involvement of a plastic surgeon at the index surgery can improve outcomes.

For most surgeons, a list of the putative risk factors which predispose a patient to postoperative wound complications would include a history of multiple surgeries, meninomyelocele, extensive scarring, sacral tumors/sacrectomy, radiation exposure, history of chronic steroid use, history of chronic smoking and persistent cerebrospinal fluid leak [11,15]. For elective surgery, preoperative optimization must include an assessment of the patient's nutritional status and addressal of relevant comorbid conditions: this includes building up a patient's haemoglobin, ordering the glycated haemoglobin (HbA1c) test in diabetic patients, assessment of albumin (ideally, > 2.0 g/dl) and prealbumin (ideally, > 20 mg/dl) and seeking consultation with a dietician if found to be abnormally low and absolute cessation of smoking.

In morbidly obese patients, strong consideration should be given to refer them for bariatric surgery first – bariatric surgery patients who undergo spine surgery have been reported to experience lesser complications compared to morbidly obese patients who do not undergo bariatric surgery [16]. Where possible, minimally invasive approaches including the use of percutaneous screws should be preferred in such patients. Surgical exposure and wound closure – which is often delegated to residents or fellows - should be performed by the senior operating surgeon in such cases. If dead space or inability to close the deep fascia over the implants is expected or encountered at closure, assistance should be sought from a plastic surgeon – simple mobilization of local paraspinous flaps during the index surgery may prevent the need for a more demanding reconstructive procedure later on. In the case presented by Brown and Rubayi, despite the wound dehiscence, the patient did not have exposed implants.

We believe that there is some merit in considering the use of vacuum-assisted closure (VAC) therapy in such cases as well. The therapeutic effects of VAC therapy are largely based on two mechanisms: i) removal of excess fluid which reduces the interstitial pressure around the wound and enhances local blood flow, and ii) mechanical stimulation of reparative cells increasing the granulation tissue [17]. Even if vacuum-assisted wound closure may not be sufficient in itself for such large tissue defects as the one described by the authors, it may aid in converting a larger, complex wound into a smaller, simpler one. After successful vacuum assisted wound treatment, the patient may end up needing a much simpler solution on the reconstructive ladder – reducing the morbidity of the reconstructive procedure [18].

More recently, Dyck et al. have also reported on the beneficial effects of incisional vacuum assisted closure in the prevention of postoperative wound complications in high-risk patients undergoing spine surgery. An incisional VAC dressing was applied over the primary wound closure in 21 patients who met 'high-risk' diagnostic criteria for being susceptible to postoperative infection – compared to patients who received only standard wound dressings, patients with an incisional VAC dressing had a 50% lower incidence of surgical site infection in the postoperative period [19].

Our personal experience with incisional VAC dressing – particularly, in morbidly obese patients who typically have serosanguinous discharge in the early postoperative period due to fat necrosis – has been favorable. In patients with extensive scarring due to prior surgeries – which most often, in our setup are paediatric spinal deformity patients with implanted growing rods - assistance from a plastic surgeon may be sought to apply tissue expanders. We believe that this article raises important questions: i) can we identify the preoperative risk factors in patients un-

dergoing spine surgery which places them at an increased risk of post-operative wound complications? and ii) can we demonstrate clear-cut benefits in terms of healthcare costs, of liaison between spine surgeons and plastic surgeons in such selected patients?

We hope the readers of NASSJ are stimulated to undertake studies which can answer these questions.

Declaration of Competing Interest

Dr. Bhavuk Garg and Dr. Nishank Mehta declare that they have no conflict of interest.

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Inform consent statement

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