Surgical Techniques in tackling Venous Plexus around C1/2 Facet Joints in Posterior Cervical Approach

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ABSTRACT
Troublesome venous bleed is a significant challenge from epidural channels around facets in spine, more so at C1 and C2. Patience during surgery is the key factor to avoid and control such bleeding. Meticulous patient positioning, coagulation of venous plexus, and compression tamponade with hemostats are essential in preventing troublesome epidural bleeding.

Keywords: Atlantoaxial stabilization, Epidural bleed, Lateral mass of atlas.


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Conflict of interest: None

INTRODUCTION
Ever since screws were introduced in the stabilization of atlas and axis, the anatomical area around C2 ganglion and C1/C2 facet joint has become a frequent site to be dissected by surgeons with great care to expose the posterior surface of lateral mass of atlas, the center of which is the screw entry point in C1. The challenge is the presence of abundant venous plexus that may bleed profusely, frustrating the surgeons before exposing the facet joint. The venous plexus is formed by liberal communicating venous channels from cervical extradural veins and extraspinal veins in and around C1/2 facet joints and C2 ganglion and are also in continuation both cranially and caudally. Hence, surgeons should know the tricks of tackling these bleeds and develop skills in arresting them comfortably. Venous bleed can be reduced by patient positioning, anesthetic control, cautery, and hemostats.

Patient Positioning
Patient is positioned prone on two side bolsters and the head is fixed with a three-pin clamp. Neck and abdomen are free from compression. The tilting operating table is positioned so that the head end is kept higher than the heart level. Neck is positioned as per the need for the procedure. Usually for subluxations of C1/2, extension at craniocervical is essential. Keeping the venous plexus above heart level is the ultimate goal (Fig. 1).

Anesthetic Points
A good patent endotracheal tube well secured at the mouth and three-pin clamp is important. A good end-tidal volume of carbon dioxide between 27 and 34 and positive end-expiratory pressure airway pressure between 15 and 20 cm/H2O should be maintained by the anesthesiologist which will help in handling the venous plexus with comfort.

Surgical Technique
The paraspinal muscles are subperiosteally dissected from medial to lateral fashion, first at C2 from spinous process, lamina, over the inferior facet, and then toward pars that leads to atlantoaxial facet joint. This dissection is done by a sharp small subperiosteal elevator or by using a low-current monopolar cautery in coagulation mode. The pressure exerted by the monopolar cautery is negligible and hence, no unwanted movements are appreciated. The same way, muscles over arch of atlas are also dissected from medial to lateral fashion until the lateral end is reached. While this procedure is being
done, tissue over and at the edges of C2 lamina (superior) and C1 arch (inferior) are dissected away from medial to lateral direction until C2 ganglion is exposed laterally. C2 ganglion is seen lying posterior to facet joint and posterior wall of lateral mass of atlas just below the inferior edge of arch laterally. The venous plexus will be seen from the spinal canal, over and around the ganglion.

A blunt 2 or 3 mm nonsticky bipolar-tipped forceps is used to coagulate the venous channels at a very low cautery current starting from medial side over the dura in the canal laterally in the process of shrinking the venous channels (Fig. 2A). The shrunk and fibrous tissues need to be cut (Fig. 2B) and further coagulation is continued over and around the ganglion (Fig. 3). This is very important since the venous channels are much easier at the spinal canal end than laterally where they are large.

The ganglion is then cut (Fig. 4A) and posterior wall of lateral mass reached. Venous channels can be seen anterior to ganglion too (Fig. 4B). By this meticulous approach, supported by good saline irrigation and a good suction tube of 2 mm, the venous channels at this region are easily excised and the screw entry point of lateral mass of atlas exposed well. However, occasionally, the venous channels are very large and they need packing with hemostats. The volume of hemostats sometimes becomes a nuisance and space occupying though bleeding may be completely arrested. Shreds and small sheets of oxidized cellulose are ideal at this region than using expanding gel foams (Figs 4C and D). Small cotton patties should be used to give tamponade over the hemostats. Important sites at lateral epidural regions that are above and below the C2 nerve root need to be mentioned. Microsurgical view with good illumination is mandatory to prevent neurological deficits during hemostat packing. Large cotton pieces and excessive tamponade need to be avoided. The surgeon should maintain discipline and patience to achieve hemostasis to achieve a good screw placement in lateral mass of C1 (Fig. 5).
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Figs 4A to D: (A) Cutting of right C2 ganglion. (B) Bleed from the venous plexus superolateral to ganglion. (C) Packing of bleed superolateral to ganglion with surgical hemostat. (D) Packing of bleed in superomedial to ganglion with surgical hemostat

Fig. 5: Lateral mass screw at C1

REFERENCE