TECHNICAL NOTE

Prevention of Devastating complications following Percutaneous Vertebroplasty-A Technical Note

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INTRODUCTION-

The first vertebroplasty was performed in 1984 by French radiologists for treatment of a hemangioma. [1] Vertebroplasty eventually went on to revolutionise the treatment of painful osteoporotic fractures and few vertebral body tumours. Now a day's vertebroplasty is done mainly by interventional radiologists and the spinal surgeons. Though there are very few complications as cement leakage in adjacent areas of this procedure, PMMA (cement) leakage via venous channels following percutaneous vertebroplasty can be life threatening. [2, 3.] Devastating complications because of the cement emboli lodging in various organs leading to pulmonary embolism,[4] acute respiratory failure,[5] intracranial embolic stroke,[6] inferior vena cava syndrome,[7] & cardiac perforation with tricuspid regurgitation[8] are published in literature. These life threatening complications are uncommon but can be easily prevented by use of our technique of gel foam embolization of venous channels. The purpose of this technical note is to demonstrate the usefulness of Gel foam embolization and its intraoperative effectiveness in preventing devastating complications.

TECHNIQUE-

Percutaneous vertebroplasty under image intensifier was planned in a 69 year female with L1 vertebral body osteoporotic wedge compression fracture [Fig 1]. For vertebroplasty the patient was positioned supine and the procedure was carried out under local anaesthesia with sedation. Localization of the pedicles was performed with the aid of the image intensifier. We used the transpedicular route to reach the vertebral body. This route offers several advantages over the parapedicular route. Pedicles provides a definite anatomical landmark for needle targeting prevent damage to adjacent structures and a biopsy can be carried out through the same route. Using the transpedicular route, the needle was centered at the 10 o'clock over the left pedicle or 2 o'clock over the right pedicle on the AP view. One may have to start the entry point slightly more superior so that the needle is able to traverse the vertebral body without penetrating the fractured and collapsed superior end plate. The needle was medialised through the cylinder of the pedicle to reach the middle of the vertebra. Once the first cortex was pierced and a footprint was obtained by the needle in the pedicle, and the position was considered ideal on the AP view and, advancement of the needle was done under the guidance of the lateral fluoroscopy. In osteoporotic bone, penetrating the bony cortex and advancing the needle into the vertebral body is easy. The tip of the needle should lie beyond the midpoint of the vertebral body on the lateral view. The ideal endpoint was the junction between the anterior and middle thirds of the vertebral body [Fig 2].

Fig 1: T1 Sag.MRI, Painful L1 Compression Fracture

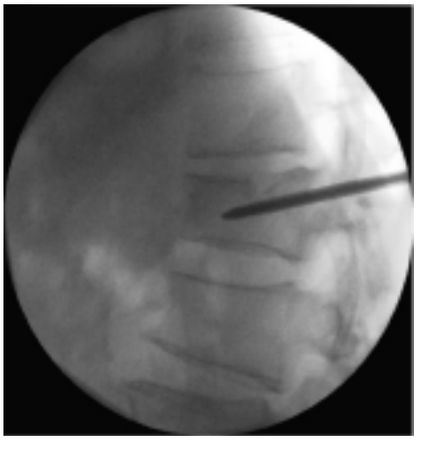

Fig 2 – Insertion of the needle through transpedicular route to reach the middle of the fractured vertebral body.

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Once the above stage was reached, Gel foam embolization[9] was carried out as follows.

Radioqpaque dye (Niopam) was used to confirm and map the venous channels [Fig 3] in the image intensifier. Most of our cases show the leakage of contrast dye in anterior internal plexus from intravertebral, basivertebral veins spreading away from the particular vertebral body. (Fig 4). We prepared 4 to 7 cc gel foam crushed particles mixed with saline forming soft gel like concentrate (Fig 5). This was injected into the vertebral body through the portal created by Jamshedi needle. This gel foam concentrate blocked the end on venules and the inner fractured shell of the vertebral body forming the soft internal coating. A repeat injection of the same dye was performed again and the venous channels that showed on the preembolisation injection did not reappear (or were not refilled with the dye) (Fig 6). This proves our hypothesis of venous block by these gel foam particles that acts as fillers.

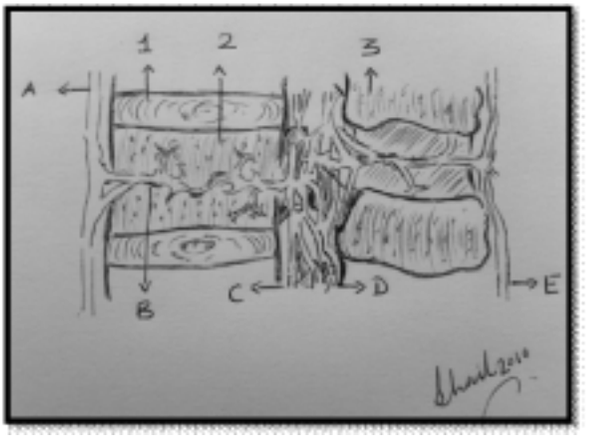

Fig.3 Anatomy of Vertebral Veins:
1- Intervertebral Disc, 2-Vertebral Body, 3-Spinous Process
A -Ant.Ext. Vertebral Vein, B-Basivertebral Vein, C=-Anterior int. Vertebral Vein,
D-Posterior int. Vertebral Vein,E-Posterior Ext.Vertebral Vein,

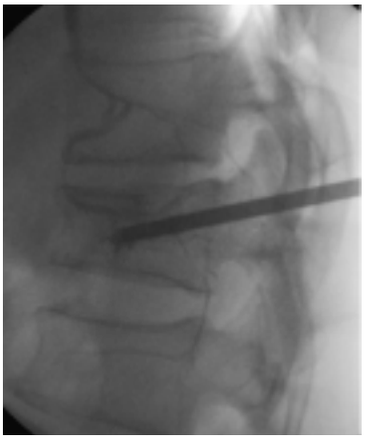

Fig. 4:Intraosseous Venography showing dye via Basivertebral vein leakage.

Figure 5: Preparation of the gelfoam and saline solution for injection.

Fig. 6: Disappearance of dye / venous channels after the Gel foam embolisation

After confirmation on image intensifier, we injected PMMA (cement) (Fig 7).The entire process of gel foam embolization and image confirmation takes around 2 minutes in sequence and is very cost effective.

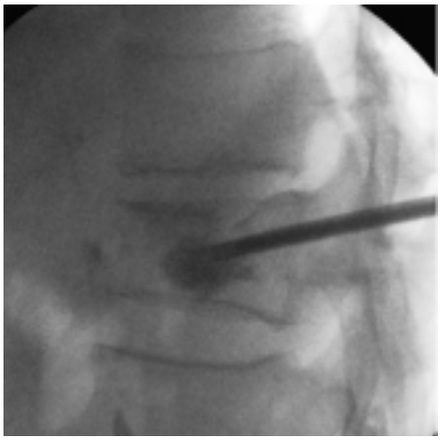

Fig 7: Injection of Cement (PMMA)

Conclusion: The procedure of Gel foam embolisation under image intensifier before injecting PMMA (cement) in percutaneous vertebroplasty reduces venous leakage of cement significantly, and risk of complications can be nullified. We did not have any complications arising from the cement emboli primarily dislodging from the venous access in our series of 81 levels in last four years. This is a unique and simple technique for preventing devastating complications occurring in percutaneous vertebroplasty.

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