Hand Assisted Gauze Retractor for Right Hepatic Lobe Mobilization

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Abstract Due to lack of tactile feedback, available retractors might inadvertently cause traumatic injury to the liver, leading to unnecessary bleeding, especially in patients with bleeding diathesis. Hand-assisted retraction might also be less than ideal, either due to wrist fatigue leading to frequent change in magnitude and direction of traction, fear of undue tension on draining veins, fear of subcapsular tumor rupture, or simply due to slippery liver capsule. We devised a simple trick using a piece of gauze for safer mobilization of the right lobe; especially those bearing large subcapsular tumors. This maneuver offers better caval exposure, less IVC compression, less twisting on hilar pedicle, and less pressure on tumor-bearing hepatic parenchyma, thus, decreasing incidence of dissemination. Favorable results were obtained when this technique was applied on the large right lobes with long anteroposterior diameter and convex lateral surface like those bearing subcapsular tumors; however, no advantage was found in small firm cirrhotic liver. This technique allows adequate and prolonged surgical exposure with minimal wrist strain with flexible change of position allowing readjustment in either the tensile force or in the vector direction; however, impact on hemodynamics needs further assessment.

Keywords Liver retractors · Conventional approach for hepatectomy · Subcapsular liver tumor

Introduction

The aim after retraction is to provide steady maximum exposure, maximum leverage with suitable magnitude and direction of traction without ill effects on the retracted tissues. Right lobe mobilization is usually an initial step of the conventional approach of hepatectomy, which is still adopted by many surgeons due to its advantageous exposure, safer, and earlier vascular control.

Idea of Liver Retractor

In order to obtain optimum exposure, right lobe needs to be pulled in two directions, medially and anteriorly; however, in some difficult cases requiring prolonged maintenance of position, optimum exposure could not be ideally achieved, either due to wrist fatigue leading to frequent change in magnitude and direction of traction, fear of undue tension on liver capsule and its draining veins, fear of subcapsular tumor rupture, or simply due to slippery liver capsule. Taken together, traction unconsciously becomes unidirectional (medially), causing compression on the IVC and twisting at the pedicle, leading to more ischemia of the whole liver [1].

We devised a simple trick that may solve this problem; we used a piece of unfolded gauze; one end was applied on the right lobe adjacent to the IVC, approximately 2 cm away from the IVC, and maintained in position by gentle finger tip pressure; gentle traction on the other end of the unfolded gauze using the other hand in anteromedial direction provided sustained prolonged traction in more vertical direction, which is the sum of vectors in two directions. This simple maneuver will provide, better caval exposure, less pressure on IVC, less twisting on hilar pedicle, less pressure

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Fig. 1 Point A: on liver capsule 2 cm away from the IVC, gauze is fixed in position by gentle finger tip pressure. Point B: gauze is pulled by other hand in anteromedial direction. Displacement: is the direction of displacement, which is the sum of two vectors **a** and **b**

on tumor bearing hepatic parenchyma. More than one piece of gauze could also be employed; placing one end on different points on the liver parenchyma (2 cm away from IVC) avoiding tumor bearing area and stabilized with more than one finger, pulling the other ends together with other hand. This simple maneuver has the advantages of conventional approach during right lobectomy, namely safer and earlier vascular control avoiding any substantial and cumbersome bleeding from deeper liver planes, right or middle hepatic veins. An advantage, that could not be fulfilled using anterior approach [2].

Mathematical Explanation of Our Trick

The sum of two vectors is represented by laying the vectors head to tail in the sequence to create a triangle. One vector, which is represented by an arrow that starts from initial point A (end of gauze on the liver near IVC) and directed anteriorly along the liver surface; and a second vector ends at terminal point B (other end of gauze pulled by the other hand) and directed leftward and anteriorly; the resultant force is mainly uplifting in the direction of point A to point B (away from the

IVC) (Fig. 1). On applying this principle to surgical setting, we conclude that less hilar pedicle torsion is anticipated if the resultant force is rather uplifting, and not rotational.

Our Experience and Limitations

From our limited experience, patients showed satisfactory hemodynamics without marked change in central venous pressure or arterial blood pressure during right lobe mobilization; however, not in patients with small cirrhotic liver, this might be explained by the more horizontal direction of traction in small livers exerting more pressure on the IVC. In the proposed comparative study, some variables such as previous hepatectomy, tumor size, and vascular inflow control application should be considered when comparing two groups of patients and, of course, bigger number of patients should be enrolled in the study.

Conclusion

This technique allows adequate and prolonged surgical exposure with minimal wrist strain with flexible change of position allowing readjustment in either the tensile force or in the vector direction without undue pressure on the subcapsular hepatic tumors; however, impact on hemodynamics needs further assessment.

Conflict of Interest Statement All authors declare and deny financial, personal, or any conflict of interest.

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