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Case Report

Parenchymal Preserving Approach with Hepatotomy and Lesionectomy Using Surfacing Technique for Deep-Seated Liver Lesions

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Abstract

Though anatomical resections are considered the standard of care for primary and secondary liver tumors, non-anatomical resections are preferred in specific scenarios mainly for preserving the normal liver parenchyma [1]. The fundamental principle behind this non-anatomical resection is the preservation of functional liver volume without any compromise on tmor margins. Comparable overall and recurrence-free survivals are being reported in favor of non-anatomical resections, more so in low-grade neuroendocrine tumors and colorectal liver metastases [2,3]. The basic understanding of a non-anatomical resection is to excise the lesion along with a rim of surrounding liver parenchyma, ensuring a negative margin all around. This is usually in the form of a wedge resection resulting in a three-dimensional defect. In lesions located away from the surface, the purpose of this wedge excision is purely for technical feasibility. This may result in a significant parenchymal loss despite the small size of the lesion. Furthermore, when resections are being considered the gold standard for any primary or metastatic liver lesions, because of the location and fear of loss of parenchyma due to wedging, non-operative therapies especially radiofrequency ablation are employed [4]. The available state-of-the-art equipment has ensured stringent monitoring in the peri-operative period, promoting complex liver resection with oncological precision. Here, we describe a new approach in surgical resection for deep-seated liver lesions by a hepatotomy followed by lesionectomy. In this technique, intraoperative ultrasonography (IOUS) is an imperative component guiding the resection plane. Following lesionectomy, the hepatotomy was approximated using intermittent sutures.

Keywords: parenchyma preserving; hepatotomy; lesionectomy; metastatectomy; deep-seated liver lesions

Case Presentation

A 65-year-old gentleman initially diagnosed as metastatic neuroendocrine tumor involving the head of the pancreas underwent staged resection. The first resection was pancreaticoduodenectomy followed by right hepatectomy for multiple metastatic lesions involving segments 5,6, and 7. On a routine follow-up at two years, ultrasonography revealed a lesion in segment 3. Additionally, a contrast-enhanced computed tomography (CECT) and 99mTc-Hynic-TOC scan were performed. The lesion was enhanced in the arterial phase with a positive uptake of the 99mTc-HynicTOC scan, confirming the diagnosis of a metastatic neuroendocrine lesion. Subsequently, after the 3-D reconstruction using the Myrian XP platform (for precise mapping of the lesion and assessing remnant liver volume), the patient was planned for a parenchyma preserving lesionectomy. After adequate mobilization of the liver, the lesion was located with the help of intraoperative ultrasonography (IOUS). The depth of lesion from the surface and the relationship with surrounding vasculature were noted as shown in Figure 1.

Figure 1: Initial marking of the extent of the tumor using Intra-operative ultrasonography.

The plane of hepatotomy on the superior surface of segment 3 and the area of the liver corresponding to the lesion on the inferior surface of segment 3 was marked with the help of IOUS. The hepatotomy was started from the nearest surface, and IOUS was used frequently to avoid major vessels on the hepatotomy plane. The liver parenchymal transection was performed using the Cavitron Ultrasonic Surgical Aspirator (CUSA) and bipolar electrocautery as shown in Figure 2.

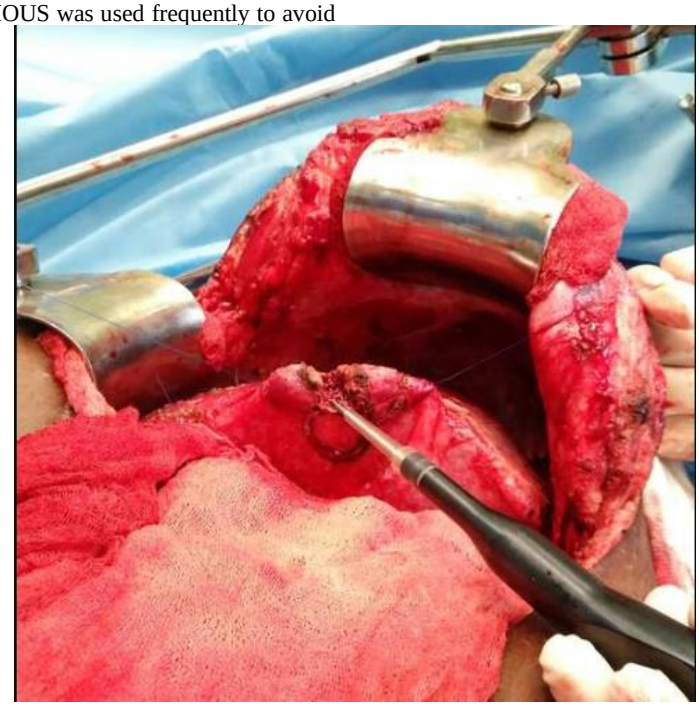

Figure 2: Initial hepatotomy using CUSA (Cavitron Ultrasonic Surgical Aspirator).

After the initial hepatotomy until the lesion's superior border, a curvilinear path opted to surf onto one side of the lesion. This opened up a new surface wherein the lesion became superficial which is shown in Figure 3.

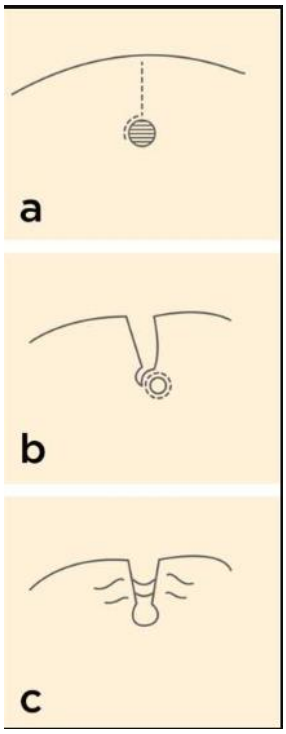

Figure 3: Depiction of the surfacing technique. A. Initial hepatotomy after reaching the superior border of the lesion takes a curvilinear path.

Authors wish to name this technique 'surfacing'. The feeding vessels were ligated and divided. After reaching the distal-most margin, the lesion could be resected easily in a hemispherical plane as a wedge as shown in Figure 4

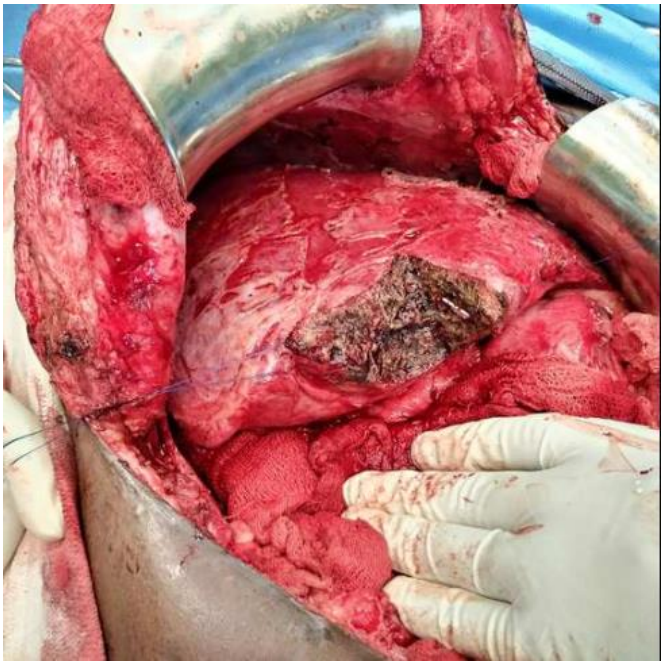

Figure 4: Completed lesionectomy following ligation of vascular pedicle

The hepatotomy plane was approximated with interrupted sutures to prevent any possible bile leak and bleed from the raw area as shown in Figure 5. The biopsy showed a well differentiated neuroendocrine tumor with negative margins. Patient had an uneventful recovery and was discharged by post-operative day 7.

Discussion

Parenchyma preserving liver resection is an alternative strategy aimed to increase the FLR. They may vary from non-anatomical resections (enucleations, sub-segmentectomies, and wedge) to anatomical resections like monosegmentectomy, bisegmentectomy, central hepatectomy). Multiple studies have confirmed their safety and efficacy with comparable overall and recurrence-free survival rates. These conservative approaches preserve the functional liver volume, where otherwise extended resections may not be possible or in bilobar disease or patients requiring redo resections. Our patient had already undergone a right hepatectomy in the past, and hence the most feasible option was to excise it locally with a negative margin. The initially described technique of

cherry-picking became a popular form of non-anatomical lesionectomy [3]. Their description involves IOUS localization of the lesion followed by division of the glissonian capsule. Following this, a sonography guided digital dissection was employed to enucleate the tumor. The authors also prefer employing the cherry-picking technique using electric scissors, electrocautery, or CUSA for multiple lesions located closely within the same area of the liver. Following excision, and hemostasis was achieved by energy sources or by suture ligation. The raw area was left open, while the possibility of bilioma or hematoma might mandate re-exploration. Deep-seated lesions pose a challenge as most of them may require a segmentectomy or a lobectomy. In such scenarios, local ablative therapies are employed in managing deep-seated lesions [4]. In lesions within the parenchyma but close to the surface, wedge resections are preferred. However, this again results in loss of normal parenchymal volume disproportionate to the tumor volume. IOUS helps in this situation to localize the tumor and guide resection with a negative margin. Torzilli et al. have pioneered IOUS in liver resections for tumors in difficult locations [5]. Our technique is similar to the one used in deep-seated brain tumors and brain abscesses. The brain parenchyma above the lesion is divided to approach rather than excised. Subsequently, the lesion is enucleated with a small margin [6]. The findings of intra operative ultrasound are critical in deciding the type of resection. The techniques like the mesohepatecomy, mini-mesohepatectomy, and liver tunnel are recommended only after confirming the presence of intercommunicating veins or inferior right hepatic vein [7,8]. Another critical point of concern is the margin status and is now agreed on 1 mm as the minimum desired negative margin. Viganò L et al. published a report on the tumor detachment from the vascular structures during metastasectomy for colorectal liver metastasis. The authors have classified the margin as parenchymal and vascular. When hepatic or portal pedicles are in contact with the tumor, it is resected off while taking care to preserve the vascular structure. Although they found R1 parenchymal positivity has high recurrence rates, interestingly, the R1 vascular margin has outcomes equivalent to that of R0 rates [9]. Our technique differs from the cherry-picking technique by starting with a hepatotomy, surfacing on one side of the lesion, lesionectomy, while preserving and controlling the major pedicles supplying the lesion. With instruments like CUSA, intra-parenchymal operations can be performed with greater precision.

Conclusion

Our technique is useful in patients for whom major hepatectomies have already been done, and when there not enough remnant volume. It can also be used to resect multiple lesions in bilobar disease, thereby not only preserving the liver parenchyma but also ensuring a negative margin with a serial ultrasonogram assessment. With the reconstruction platforms like Myrian XP exact future liver remnant can be assessed and multiple hepatotomies can be performed along the anatomical and nonanatomical planes sparing portal pedicles and hepatic veins. The essential step of creating an additional surface near the lesion makes it surfaced. However, the present technique is difficult to apply for lesions located in segment 4A or posteriorly near the hepatic venous confluence with the inferior vena cava.

Statements

Statement of Ethics

Please address the following aspects in your Statement of Ethics.

Study approval statement: This study was reviewed and approved by JIPMER ethics committee with number - JEC/89019.

Consent to publish statement: Informed consent was obtained from the patient.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

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Author Contributions

Concept; Manuscript editing; clinical advisor - Prof. Biju Pottakkat.

Raw data collection, Initial manuscript writing - DR Satyaprakash Ray Choudhury.

Idea and editing of supplementary files (Figures and tables), Initial manuscript drafting- DR Sankar Narayanan.

Manuscript editing; clinical advisor - DR Kalayarasan Raja.

Subsequent editing and submission process - DR Sakthivel H.

Subsequent editing and submission process - DR Sai Krishna

Data Availability Statement

The data of the article is available in the department database and can be provided on request.

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