A patent cranial end of the ligamentum venosum can result in hemorrhage when performing surgery in the extreme upper abdomen

Unexpected bleeding with major surgery

In the surgical management of cancer in the mid-portion of the extreme upper aspect of the abdomen, a complete resection with all visible tumor removed is a necessary part of successful long-term management. Unexpected hemorrhage has occurred with dissection in this lesser omentectomy-omental bursectomy region. In the past, the cause of this unforeseen complication of surgery was not understood. The bleeding has been determined to be originating from the transected superior aspect of a partially patent ligamentum venosum which inserts into the left hepatic vein.

Cause of unexpected bleeding

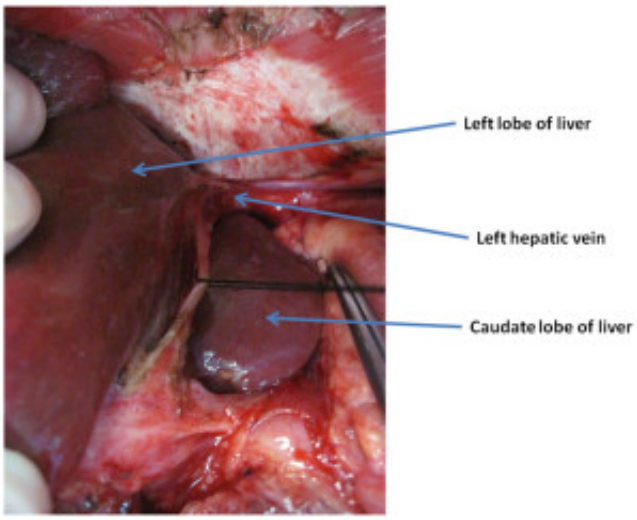

Fig. 1. The ligamentum venosum in an adult. This structure is present in the fissure separating liver segments 2 and 3 from segment 1. It lies directly beneath the liver attachments of the hepatogastric ligament which have been resected in this patient. In an adult it can be dissected away from the fissure; in this patient it is isolated by a silk ligature. Note that ligamentum venosum is slightly increased in size at its superior aspect.

In performing dissections beneath the left lobe of the liver, it is necessary to clear the fissure defined by segments 2 and 3 of the liver with the left caudate lobe of the liver. This is the “Fissure defined by the ligamentum venosum”. In dissecting the ligamentum venosum to its cranial end, this structure may expand and be found to be patent at its entrance into the left hepatic vein. Removal of the cancer specimen that involves the ligamentum venosum requires transection of this structure as it enters the left hepatic vein. Transection without ligation of the ligament venosum at its cranial end can result in hemorrhage as a part of the cancer resection procedure.

Preventing the unexpected hemorrhage

The ligamentum venosum should be identified within the fissure where it is anatomically located (Fig. 1). As the cancer specimen is removed from the superior aspect of the omental bursa, the attachments between the ligamentum venosum and the left hepatic vein should be ligated prior to the transection.

Embryology and anatomy

After closure the ductus venosus is known as the ligamentum venosum. This structure present in the adult can be most readily visualized on the superior surface of the right caudate lobe of the liver. The fossa of the ligamentum venosum is exposed when the gastrohepatic ligament is severed from its attachment to the liver as shown in Figure 1. The cranial end (the outlet) is slightly wider than the caudal portion (inlet from umbilical vein).

The ligamentum venosum in cytoreductive surgery

In patients with pseudomyxoma peritonei the lesser omentectomy propcedure is required in 47% (70/147) and in 50% of these patients the extent of tumor is such that a peritonectomy of the omental bursa is needed. In the patients who have no disease or only low volume disease in the lesser omentum, the hepatogastric ligament is removed, the ligamentum venosum visualized and this structure is left intact. In other words, a systematic resection of the ligamentum venosum in all patients is not necessary. However, patients who have a large extent of disease in the lesser omentum and superior recess of the omental bursa, the ligamentum venosum should be located beneath the hepatic branches of the vagus nerve and divided. It is then dissected away from the fissure as part of the specimen to be divided at its entrance into the left hepatic vein. If this is not done a small percentage of these patients will have bleeding as the superior aspect of the dissection is being completed. This unexpected hemorrhage is caused by the transection of a patent superior aspect of the ductus venosus. Alternatively, strong traction on the ligamentum venosum could cause a small portion of the left hepatic vein or inferior vena cava to tent up so that hemorrhage occurs when the specimen is released from the superior recess.

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