Transcatheter Angioembolization in Blunt Abdominal Vehicular Trauma.

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Learning Objective

 To highlight usefulness of trans-catheter arterial embolization in hemodynamically unstable road traffic accident patients having high-grade blunt abdominal solid visceral (liver, spleen, kidneys) injuries.

 Road traffic accident (RTA) are a major cause of morbidity and mortality in Kingdom of Saudi Arabia. Patients with blunt abdominal trauma in high speed vehicular accident may encounter high grade solid visceral injuries including active bleeding.

Uncontrolled bleeding is a major factor in early mortality after trauma, contributing to 30 to 40% of trauma-related deaths. [1] Transcatheter embolization is a lifesaving procedure that can control bleeding in an expeditious and minimally invasive manner with less disruption of normal tissues than standard surgical intervention.

- Embolization in trauma is the intentional and controlled occlusion of vessels to stop hemorrhage. Temporary embolization agents include autologous blood clots, fat, dura, muscle and fascia (which are now rarely used), and Gelfoam. Permanent agents include metallic coils and embolization particles.
- Most of the embolization agents work by creating a mechanical occlusion of the vessels and providing a framework for thrombus formation.
- Most of the embolization agents require a relatively intact coagulation cascade. It is imperative that embolization is performed before severe coagulopathy develops that may occur in a third of all patients admitted after severe trauma requiring massive blood transfusions.

The widespread use of multidetector computed tomography (MDCT) scanners in the emergency department has decreased significantly the need of exploratory angiography. MDCT images are invaluable to guide the angiography when searching for areas of suspected injuries with selective angiograms.

- In general, large vessels require coils; smaller vessels can be treated with particles, gelatin sponge (Gelfoam) or microcoils.
 If the trauma patient is relatively stable, superselective embolization is always
 - recommended to preserve organ tissue and avoid tissue ischemia or necrosis [1,2].

Imaging Findings OR Procedure findings

- Trauma team activation at Hospital emergency, readily available radiology services and close vicinity of interventional suite contributed to an early pan-CT (whole body) and subsequent intervention in our trauma (road traffic accident) patients.
- We present imaging of patients having high grade visceral injuries with active contrast extravasation that were immediately taken to radiology interventional suite for angioembolization.
- Haemodynamic stability achieved within 24 hours: 3 cases each of high grade liver, spleen and kidney in 6 months and intervened. Gelfoam or coils were used as embolization material after selective catheterization of arterial bleeder.

Imaging Findings OR Procedure findings

 Grading of injuries on CT for major solid abdominal viscera (Liver, Spleen, kidney) was documented as per American Association for the Surgery of Trauma (AAST) injury grading [3].



High Grade Hepatic Injury



Grade V







High Grade Splenic Injury



High Grade Renal Injury



Hepatic Injury

- Most parenchymal liver injuries involve small or medium branches, and revascularization from distal branches after proximal embolization is not uncommon.
- If superselective embolization with microcoils proximal and distal to the lesion is not possible, particle or Gelfoam embolization to achieve distal control followed by proximal coil embolization is recommended.
- Extensive embolization is usually well tolerated thanks to the dual supply of the liver.

Hepatic Injury

 Extensive embolization is usually well tolerated thanks to the dual supply of the liver. However, in high-grade liver injuries, major hepatic necrosis, biliary and abscess complications are relatively frequent complications.

Hepatic Injury

- High-grade liver injury (laceration) as seen on axial and coronal reformat images.
- Subsequent angioembolization was performed for contrast extravasation from right hepatic artery branch by gelfoam.





Angio-Embolization for liver injury

SELECTIVE CATHETERIZATION RIGHT HEPATIC LOBE ARTERY SHOWING CONTRAST EXTRAVASATION

- High-grade liver injury (laceration) as seen on axial and coronal reformat CT images.
- Subsequent angioembolization was performed for contrast extravasation from right hepatic artery branch by gelfoam.





Splenic Injury

- A shattered spleen with multiple areas of contrast extravasation is better treated with proximal embolization of the splenic artery using coils. Collateral circulation from the pancreatic, gastroduodenal, and gastric branches usually maintain distal splenic perfusion.
 Parenchymal injuries can be treated with selective
- Parenchymal injuries can be treated with selective distal coil or particle embolization, but if the injuries areas are too numerous, distal embolization may result in loss of as significant portion of the parenchyma and the procedure can be very timeconsuming.

Splenic Injury

- High-grade splenic injury (laceration) as seen on axial images.
- Subsequent

 angioembolization was
 performed for contrast
 extravasation from
 splenic artery branch
 by coil.



IGH GRADE SPLENIC INJURY WITH CONTRAST EXTRAVASATION



Coil-Embolization for splenic injury

- High-grade splenic injury (laceration) as seen on axial images.
- Subsequent angioembolization was performed for contrast extravasation from splenic artery branch by coil.



SPLENIC ARTERY ANGIOGRAM SHOWING ACTIVE CONTRAST EXTRAVASATION





Complications

 Splenic infarction, splenic atrophy, and postprocedure bleeding are reported complications.

Renal Injury

Injuries of the main renal artery are treated by surgical repair or placement of a stent graft. Penetrating or blunt renal injuries usually result in distal PSA or AVF. The renal arteries are true end arteries; renal parenchyma distal to the level of occlusion usually infarcts. Most of the time, distal recanalization from collateral vessels is not seen except in the rare case involving collaterals from capsular vessels. Superselective embolization of peripheral lesions usually with microcoils is recommended. For very distal injuries, the use of Gelfoam or particles is also a viable alternative.

HIGH GRADE LEFT KIDNEY INJURY

Renal Injury

- High-grade renal injury (laceration) as seen on axial images.
 Subsequent angioembolization was performed for
 - contrast extravasation by coils at upper and lower branches.



Angio-embolization for renal injury

SELECTIVE LEFT RENAL ARTERY BRANCH COIL EMBOLIZATION

- High-grade renal injury (laceration) as seen on axial CT images.
- Subsequent angioembolization was performed for contrast extravasation by coils at upper and lower branches.



SELECTIVE LEFT LOWER RENAL ARTERY BRANCH CATHETERIZATION



Conclusion

 Trans-catheter arterial embolization is a useful non-operative management (NOM) tool in hemodynamically unstable patients with high grade solid visceral or vascular injury showing active bleeding on imaging.

REFERENCES

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