Effect of technical variations on efficiency of transjugular intrahepatic portosystemic shunt placement.

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Introduction

Transjugular intrahepatic portosystemic shunt (TIPS) creation is an effective treatment for complications of hepatic portal hypertension [1]. However, TIPS creation is technically complicated, with perhaps the most difficult step being access of the portal vein (PV). This step has been reported to be associated with complications such as hepatic capsular laceration, subcapsular or intraparenchymal hepatic hematomas, gallbladder puncture/biliary tree injuries, right kidney puncture, inferior vena cava puncture and hemoperitoneum [2,3]. Furthermore, TIPS creation includes exposure to high levels of radiation for patients and operator because of its complexity, which is undesirable because of the well-known risks [4]. A number of techniques have been described for targeting the PV. These include conventional portography (wedged venography with carbon dioxide or contrast), arterial portography, the "gun-sight" technique, cone beam CT, intravascular ultrasound (US), and transabdominal US guidance [5]. This study aims to determine the effect on procedure efficiency of three different techniques of PV cannulation during TIPS placement.

Materials and Methods:

Approval for this retrospective study was granted by the institutional review board. All patients gave written informed consent for the TIPS procedure. Between January 2005 to December 2019 264 patients who underwent TIPS placement without additional complex procedure at a single academic center 264 were included in this retrospective review. The procedures were grouped by technique, as follows: Group 1 (G1) included transabdominal ultrasound-guided PV access; Group 2 (G2) included fluoroscopic guidance with wedged-hepatic portography; and Group 3 (G3) included percutaneous ultrasound guided PV guidewire placement for fluoroscopic targeting. The patients chart were evaluated for demographic data, the technical success, PGR, total anesthesia time, number of needle passes, cumulative dose-area product (DAP), cumulative air kerma (AK), fluoroscopy time, volume of contrast used, and mortality rates at 30 days post-procedure were evaluated. The anesthesia time and complication rate were also recorded.

Results

A total of 264 patients who underwent TIPS were subdivided into G1 (n=54/264 [20.5%]), G2 (n=172/264 [65.1%]) and G3 (n=38/264 [14.4%]). Mean fluoroscopic time (minutes) in G1 (34.8 ± 16.6) did not differ from G2 (38.9 ± 20.8, p=0.09) or G3 (29.5 ± 14.6, p=0.06). However, G2 patients had significantly longer fluoroscopic times than G3 (p=0.005). Total anesthesia time (minutes) in G1 (190.2 ± 45.6) did not differ from G2 (199.7 ± 59.5, p=0.15). However, G3 had significantly shorter anesthesia time (162.6 ± 39.7 minutes) than both G1 (p=0.003) and G2 (p<0.001). The mean contrast volume was significantly lower in G1 than in G2 (67.9 ± 36.8 mL vs 87.1 ± 42.9 mL, p=0.005). More intrahepatic needle passes (median, [IQR]) were required in G2 (4 [1-7]) compared with G1 (2 [1-4], p=0.004) and G3 (2 [1-4.25], p=0.039). When complications in G1 and G3 were pooled, this cohort had significantly fewer complications than G2 (p=0.013). Operator experience in Group 1 did not differ from Group 3 (p=0.99). However, operators in Group 2 had significantly more experience than in Group 1 (p<0.001) and Group 3 (p<0.001)

Procedure parameter	Group 1	Gp1 vs Gp2 p value	Group 2	Gp2 vs Gp3 p value	Group 3	Gp1 vs Gp3 p value	Overall P value
Time of fluoroscopy (min) Mean ± SD	34.8 ± 16.6	0.09	38.9 ± 20.8	0.005	29.5 ± 14.6	0.06	0.034
Anaesthesia time Mean ± SD	190.2 ± 45.6	0.15	199.7 ± 59.5	<0.001	162.6±39.7	0.003	0.004
Cumulative DAP (Gy*cm2) median (IQR)	125.60 (66.45-218.83)	<0.001	351.72 (202.12-644.77)	<0.001	78.68 (38.39-161.06)	0.221	<0.001
AK (Gy) median (IQR)	0.648 (0.303-1.057)	<0.001	1.997 (0.981-3.678)	<0.001	0.500 (0.234-0.761)	0.322	<0.001
Contrast agent (ml) Mean ± SD)	67.9 ± 36.8	0.005	87.1 ± 42.9	0.104	77.36±48.6	0.600	0.012
Number of needle passes median (IQR)	2 (1-4)	0.004	4 (1-7)	0.039	2 (1-4,25)	0.736	0.005
Operator experience (year) median (IQR)	3.06 (2.3-4.7)	<0.001	10 (2.4-19.2)	<0.001	3.1 (2.1-4)	0.994	<0.001

Discussion

Our data suggests that the use of transabdominal US or percutaneous placement of a wire into the PV improves efficiency of the TIPS procedure. In Interventional Radiology experience is often sited as a factor for procedural efficiency with more experienced operators being more efficient [6]. In this study those using traditional wedge portography had significantly more experience, suggesting that the improved AK, DAP, and fluorsocpy time seen in the US guided and PV wire cohorts is secondary to technique.

Utilizing transabdominal US or PV wire placement also resulted in significantly fewer needle passes and when the non-wedge portography cohorts were compared to the wedge portography cohort significant less complications. This again underlines the benefits of utilizing these advanced techniques of portal vein visualization for canalization.

Conclusion

The use of transabdominal US or percutaneous placement of a wire into the PV improves efficiency of the TIPS procedure and perhaps reduces complications even when utilized by less experience operators.

References

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