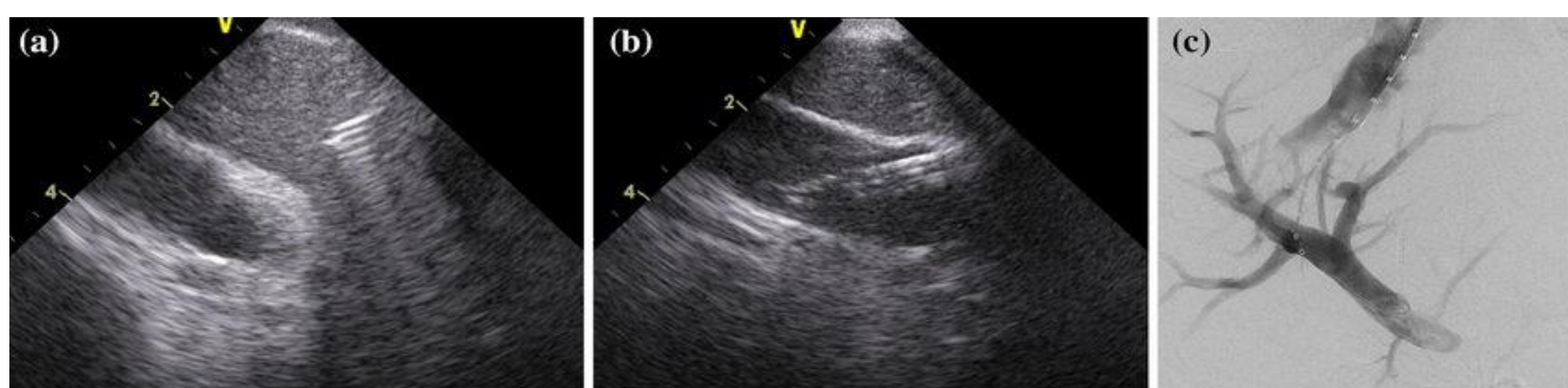


Introduction

TIPS is classically one of the most challenging procedures in interventional radiology and has required relatively high radiation doses and contrast volumes. Much of the difficulty lies in manipulating and guiding a puncture needle towards the right portal vein under limited two-dimensional fluoroscopic guidance. Intravascular ultrasound (IVUS) has been described as an adjunctive real-time imaging modality that may potentially facilitate portal vein access. Present systematic review and meta-analysis assessed potential benefits of IVUS-guided portal vein access during transjugular intrahepatic portosystemic shunt (iTIPS) creation in comparison to the conventional TIPS technique (cTIPS).

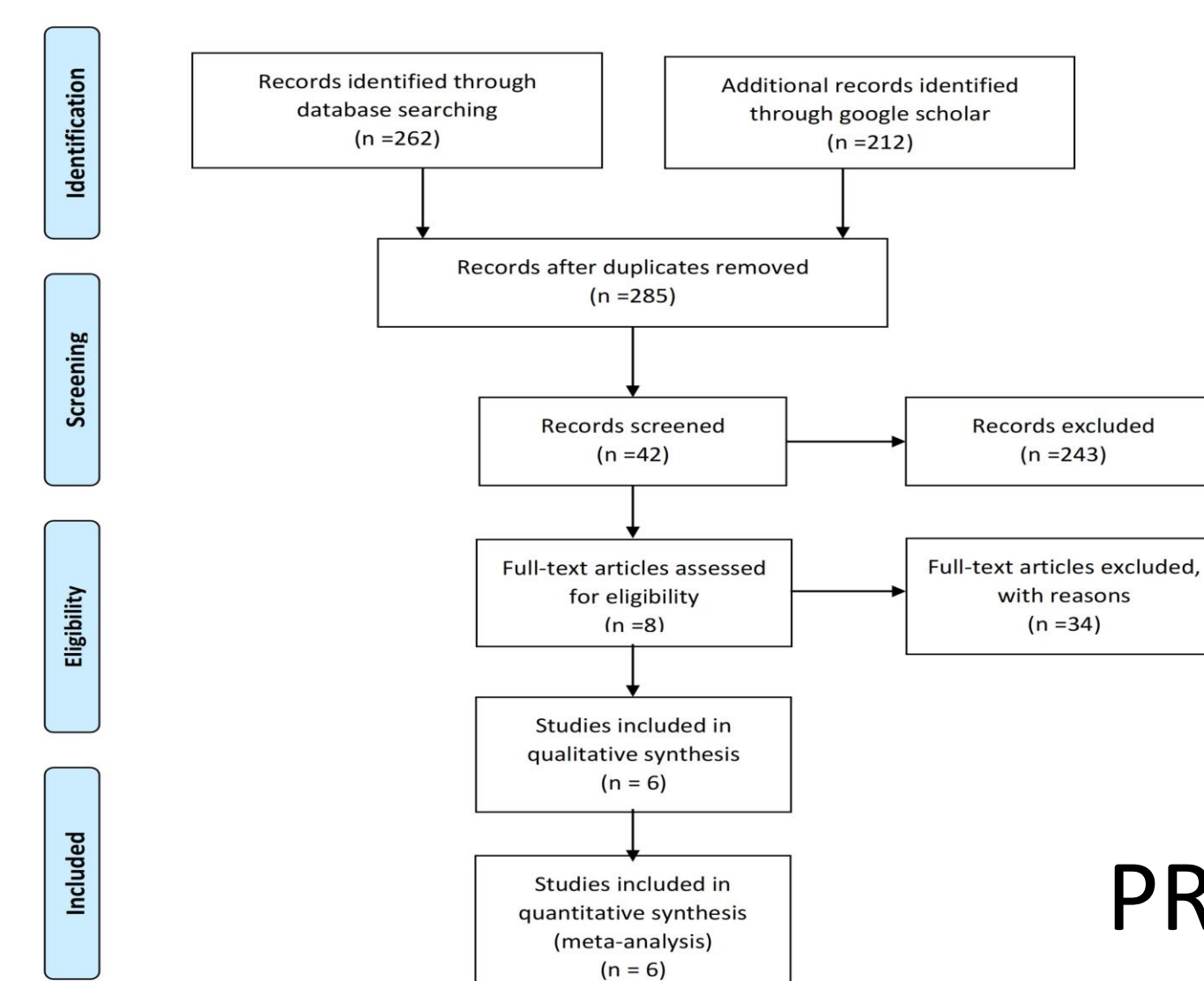


Example: The IVUS catheter was used and showing portal vein relationship to the hepatic veins in a sagittal plane. A single pass was made from the middle hepatic vein into the right portal vein a, b with clear longitudinal visualization of the needle traversing the hepatic parenchyma. (Ramaswamy RS et al., Ultrasound 2019)

Method

This meta-analysis was performed according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA). A search of databases was conducted by two researchers independently until September 30, 2021. Outcomes of interest included transjugular intrahepatic portosystemic shunt, intravascular ultrasound (US)-guided portal vein access, fluoroscopy time, radiation exposure, procedure time, portal access time, and complications. A random effects model meta-analysis was performed.

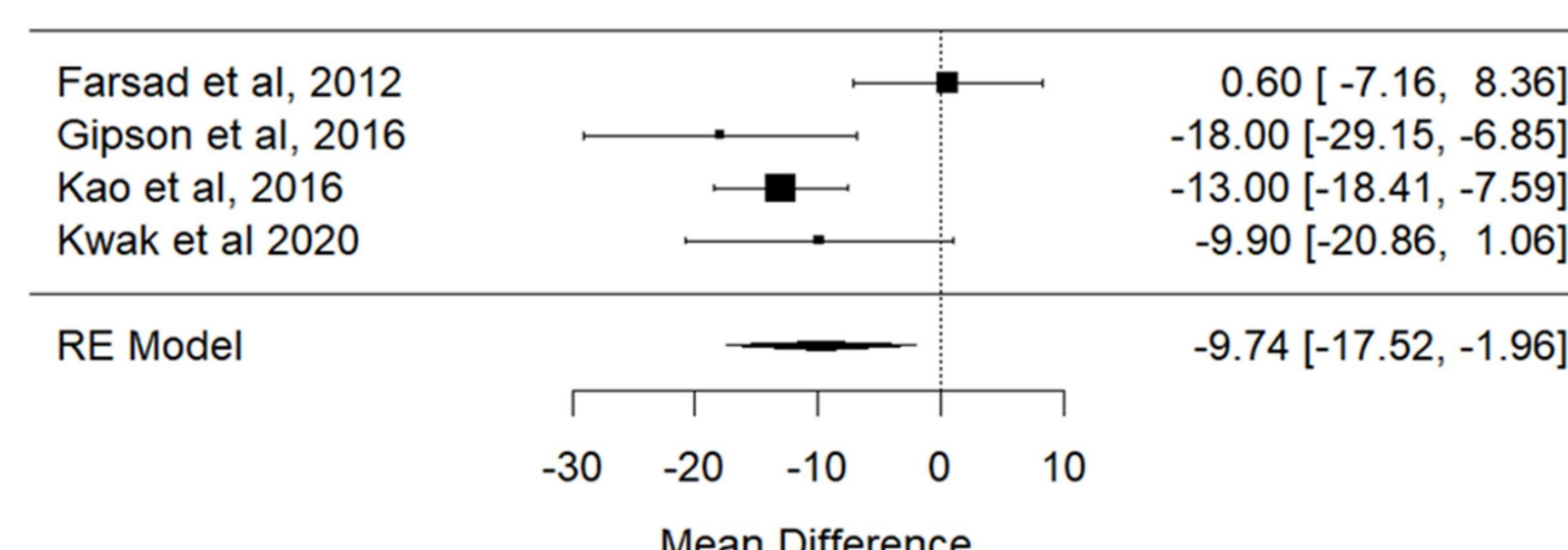
Result



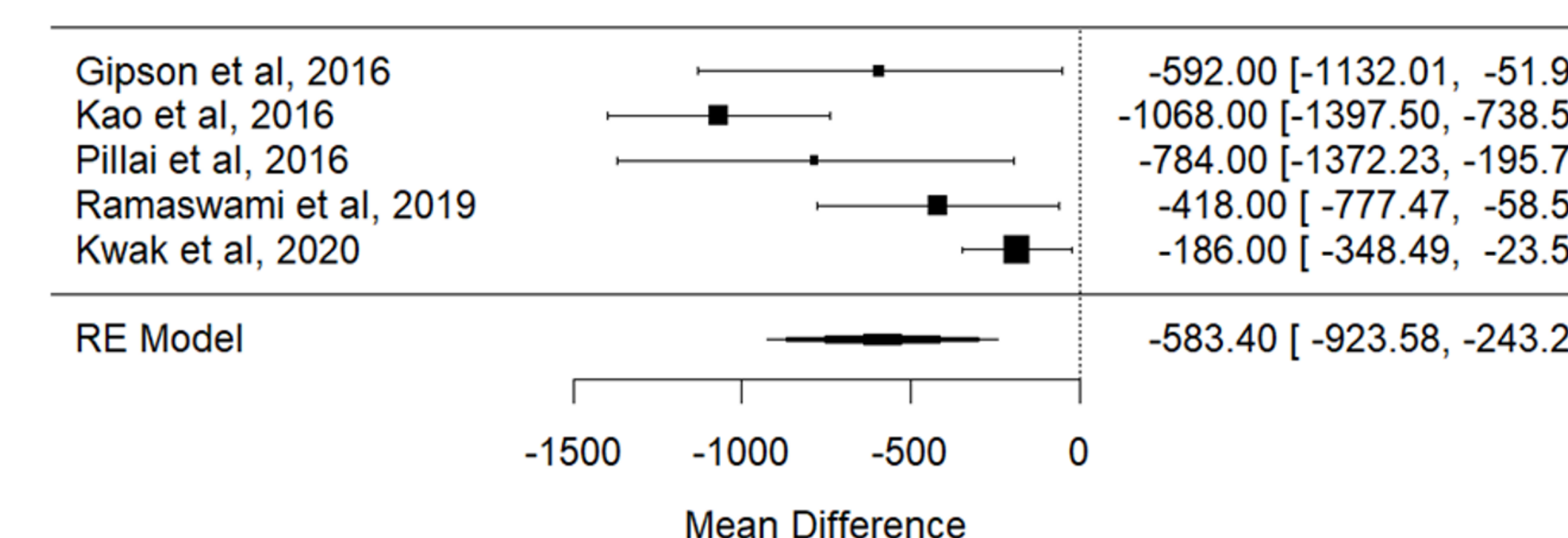
PRISMA flowchart

First author (year)	No. of IVUS	No. of conventional	Needle passes	Portal vein access time (min)	Fluoroscopy time (min)	Contrast volume (mL)	Procedure time (min)	Air kerma (mGy)
Farsad et al (2012)	25	75	4/5		30/30	-	-	-
Pillai (2015)	24	26	-	31 / 46	-	-	-	1592/2376
Gipson (2016)	40	49	-	58 / 72	27/45	135/212	124/161	850/1442
Kao (2016)	55	54	2/6		20/33	50/142	88/119	263/ 1331
Ramaswami (2019)	30	30	-	53 / 62	-	103/141	84/82	457/875
Kwak (2020)	5	6	-	26 / 50	17/27	-	61/84	139/325
iTIPS/cTIPS								

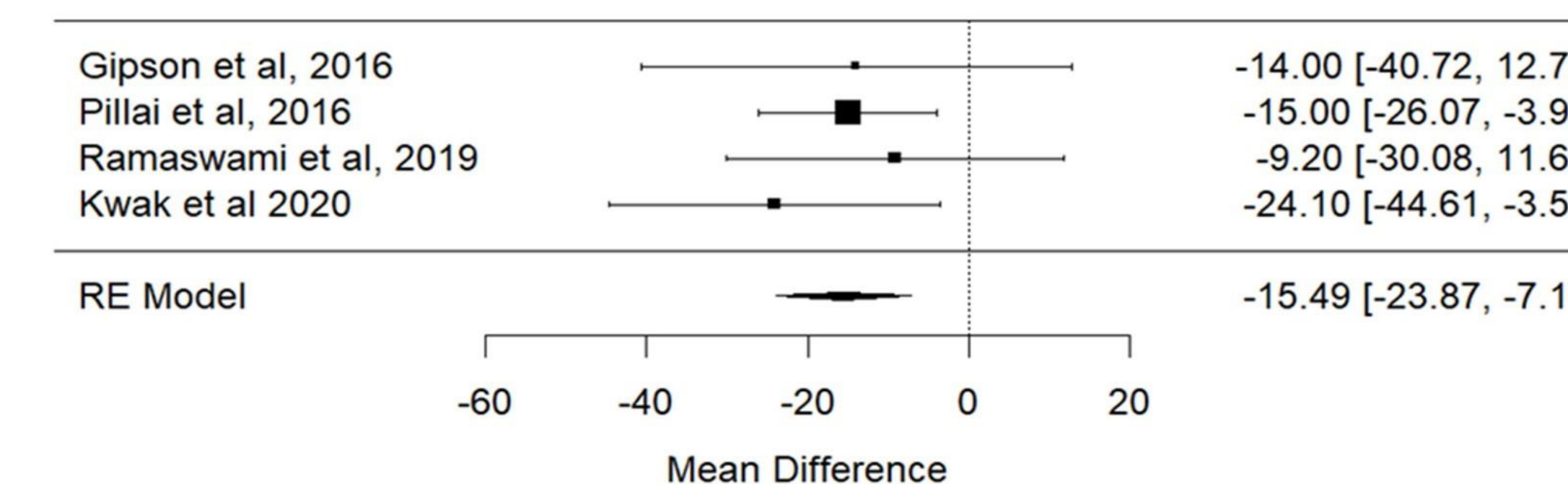
Six retrospective studies met the inclusion criteria.



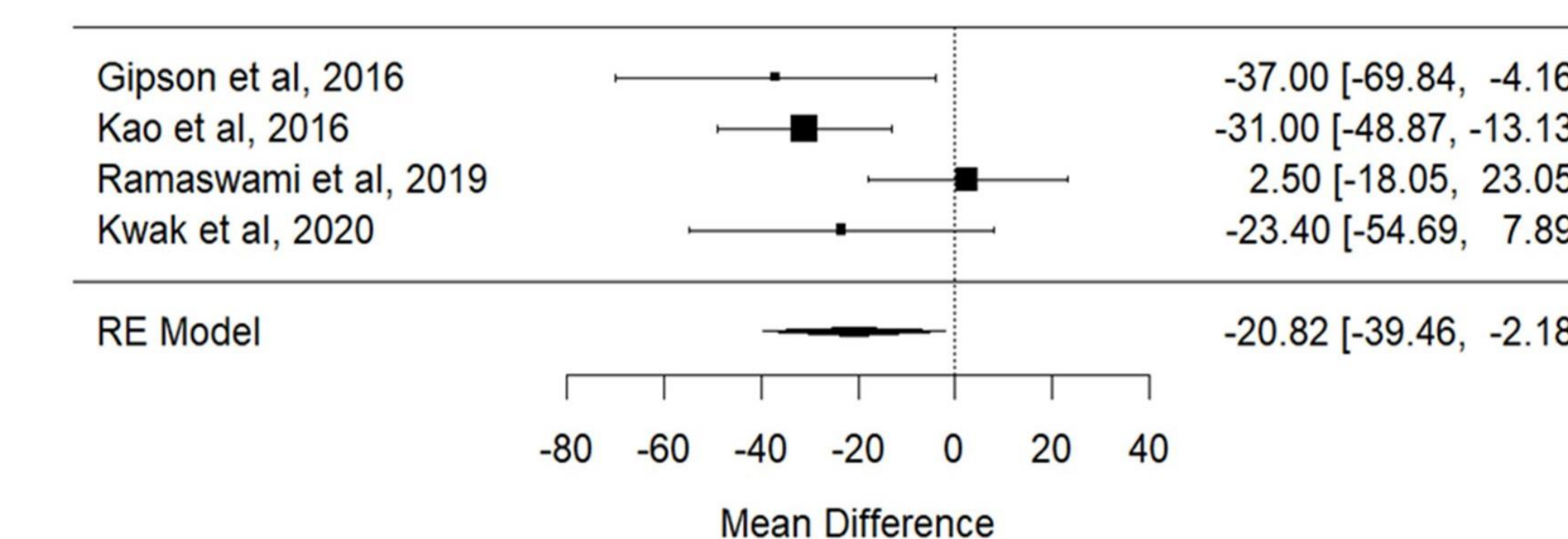
Fluoroscopy time used to perform the procedure significantly decreased in iTIPS in comparison to cTIPS by 9.74 minutes (95% CI: 17.52-1.96, p<0.001).



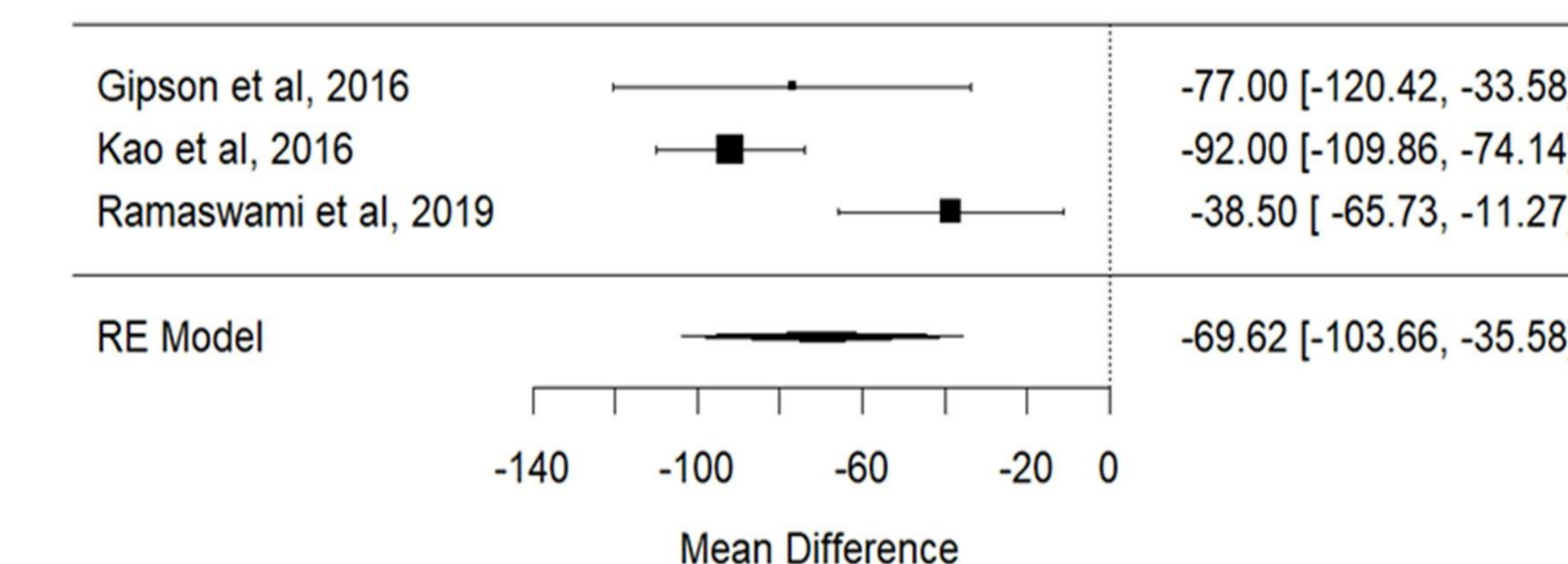
Radiation exposure (Air Kerma) significantly decreased in iTIPS in comparison to cTIPS by 583.4 (mGy) (95% CI: 923.6-243.2, p<0.001).



Portal venous (PV) access time significantly decreased when using IVUS in comparison with fluoroscopy by 15.49 minutes for portal access time (95% CI: 23.6-7.1, p<0.001).



Total procedure time and portal venous (PV) access time significantly decreased with iTIPS group by 21 minutes (95% CI: 39.5-2.2, p<0.001).



Contract volume used to perform the procedure significantly decreased in iTIPS in comparison to cTIPS (95% CI: 35.58-103.66, p>0.001).

Conclusion

Present meta-analysis revealed that when compared to the standard TIPS technique, intravascular US guiding results in a significant reduction in fluoroscopy time, Air Kerma, procedure time, and contrast agent volume. Findings advocate for a broader use of intravascular US guidance for TIPS formation, particularly in complex and radiosensitive patient populations.

References

Kew J, Davies RP. Intravascular ultrasound guidance for transjugular intrahepatic portosystemic shunt procedure in a swine model. Cardiovasc Intervent Radiol. 2004;27:38-41.
 Farsad K, Fuss C, Kolbeck KJ, Barton RE, Lakin PC, Keller FS, et al. Transjugular intrahepatic portosystemic shunt creation using intravascular ultrasound guidance. J Vasc Interv Radiol. 2012;23:1594-602.
 Kao SD, Morshedi MM, Narsinh KH, Kinney TB, Minocha J, Picel AC, et al. Intravascular ultrasound in the creation of transhepatic portosystemic shunts reduces needle passes, radiation dose, and procedure time: a retrospective study of a single-institution experience. J Vasc Interv Radiol. 2016;27:1148-53.
 Pillai AK, Iyamu I, Anene A, Reddick M, Anderson ME, Kalva SP. Clinical utility of intravascular ultrasound guided portal vein access during transjugular intrahepatic portosystemic shunt (TIPS) creation: comparison with conventional technique. J Vasc Interv Radiol. 2015;26:594.
 Gipson MG, Smith MT, Durham JD, Brown A, Johnson T, Ray CE Jr, et al. Intravascular US-guided portal vein access: improved procedural metrics during TIPS creation. J Vasc Interv Radiol. 2016;27:1140-7.