



### Comparative Efficacy of Transarterial Therapies for Hepatocellular Carcinoma: A Contemporary Analysis of TAE, TACE, DEB-TACE, and TARE

-Hepatocellular carcinoma (HCC) represents the fourth leading cause of cancer-related mortality worldwide.

-Patients with intermediate-stage unresectable disease, transarterial therapies remain the standard of care.

-This review synthesizes current evidence comparing four primary transarterial modalities: transarterial embolization (TAE), conventional transarterial chemoembolization (TACE), drug-eluting bead TACE (DEB-TACE), and transarterial radioembolization (TARE).

#### Objective

-Review and synthesize comparative evidence of transarterial therapies in HCC.  
-Assess efficacy, safety, and survival outcomes.

-Identify patient-specific factors influencing treatment selection.

-Propose future directions in personalized HCC therapy.

#### References



- Analysis of recent meta-analyses, randomized controlled trials, and comparative studies published between 2009-2025 examining efficacy, safety, and survival outcomes across the four treatment modalities.

Keywords: Hepatocellular carcinoma, transarterial embolization, chemoembolization, radioembolization, drug-eluting beads, treatment outcomes

-TARE using Yttrium-90 microspheres shows superior time to progression compared to conventional TACE (mean 17.5 vs 9.8 months) with similar or lower rates of treatment-related adverse effects and higher treatment response rates (1).

-Recent 2025 meta-analyses confirm TARE's efficacy advantage while maintaining comparable overall survival to TACE modalities (2).

-DEB-TACE demonstrates improved safety profiles compared to conventional TACE, particularly with fewer doxorubicin related side effects, with lower survival risk within the first months post-treatment (3).

-Efficacy comparisons between DEB-TACE and conventional TACE remain inconclusive, with some studies showing no significant superiority in terms of tumor response or progression-free survival (4).

-Complete radiologic response rates for DEB-TACE (25.5%) are comparable to conventional TACE (28%) (5).

-TACE for liver cancer has been proven to be useful in local tumor control, to prevent tumor progression, prolong patients' life and control patient symptoms. Recent evidence showed in patients with single-nodule HCC of 3 cm or smaller without vascular invasion, the 5-year overall survival (OS) with TACE was similar to that with hepatic resection and radiofrequency ablation (6).

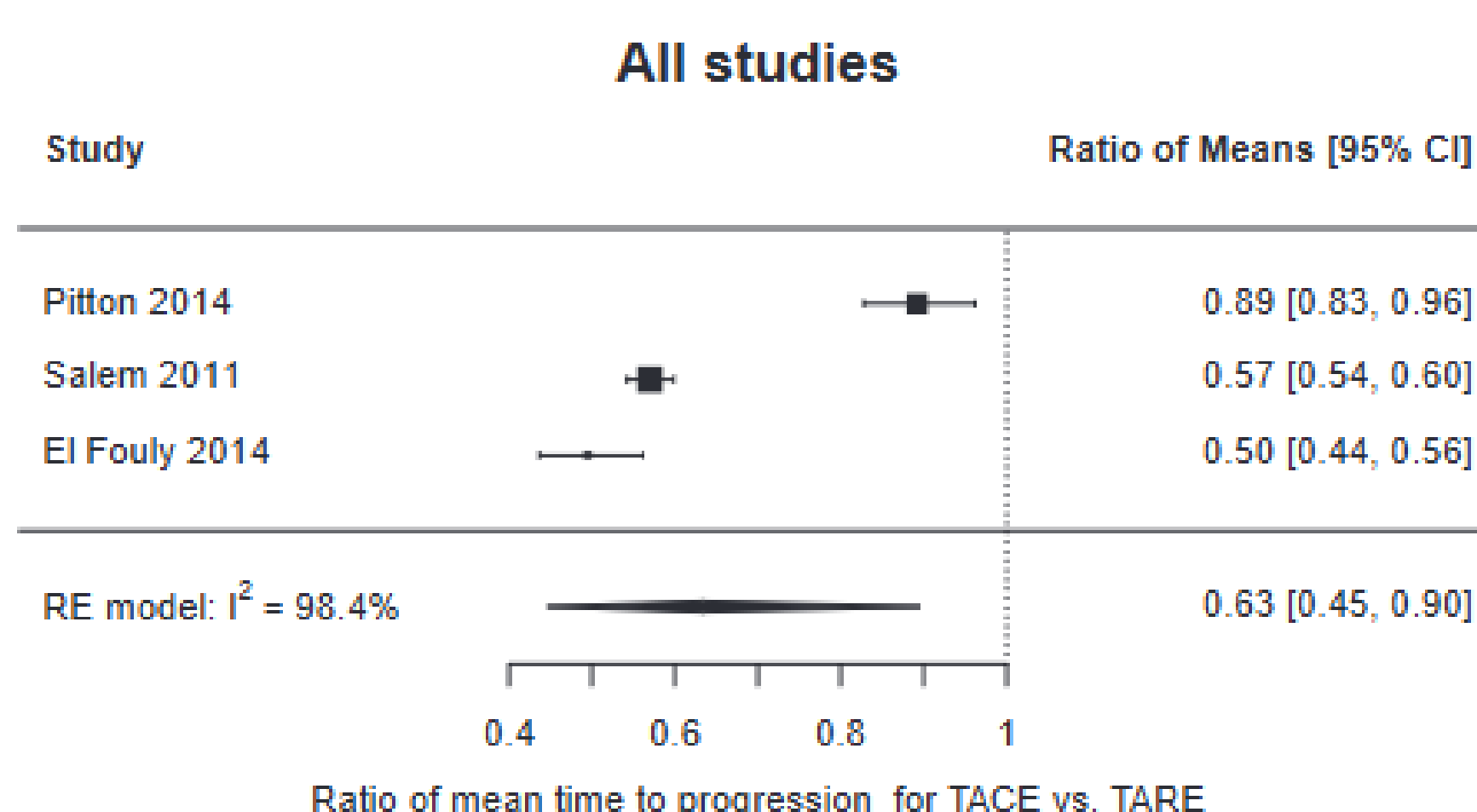


FIGURE 2. Forest plot comparing mean time to progression between transarterial chemoembolization (TACE) and transarterial radioembolization (TARE).

Optimal treatment selection depends on tumor characteristics, liver function, and patient performance status. TARE emerges as the preferred modality for patients requiring longer time to progression with minimal toxicity.

-DEB-TACE offers improved safety over conventional TACE without clear efficacy advantages. TACE remains effective for selected patients with smaller, single lesions, particularly when combined with systemic or regional chemotherapy.

-Future treatment algorithms should optimize personalized therapeutic approaches for HCC patients requiring transarterial intervention.

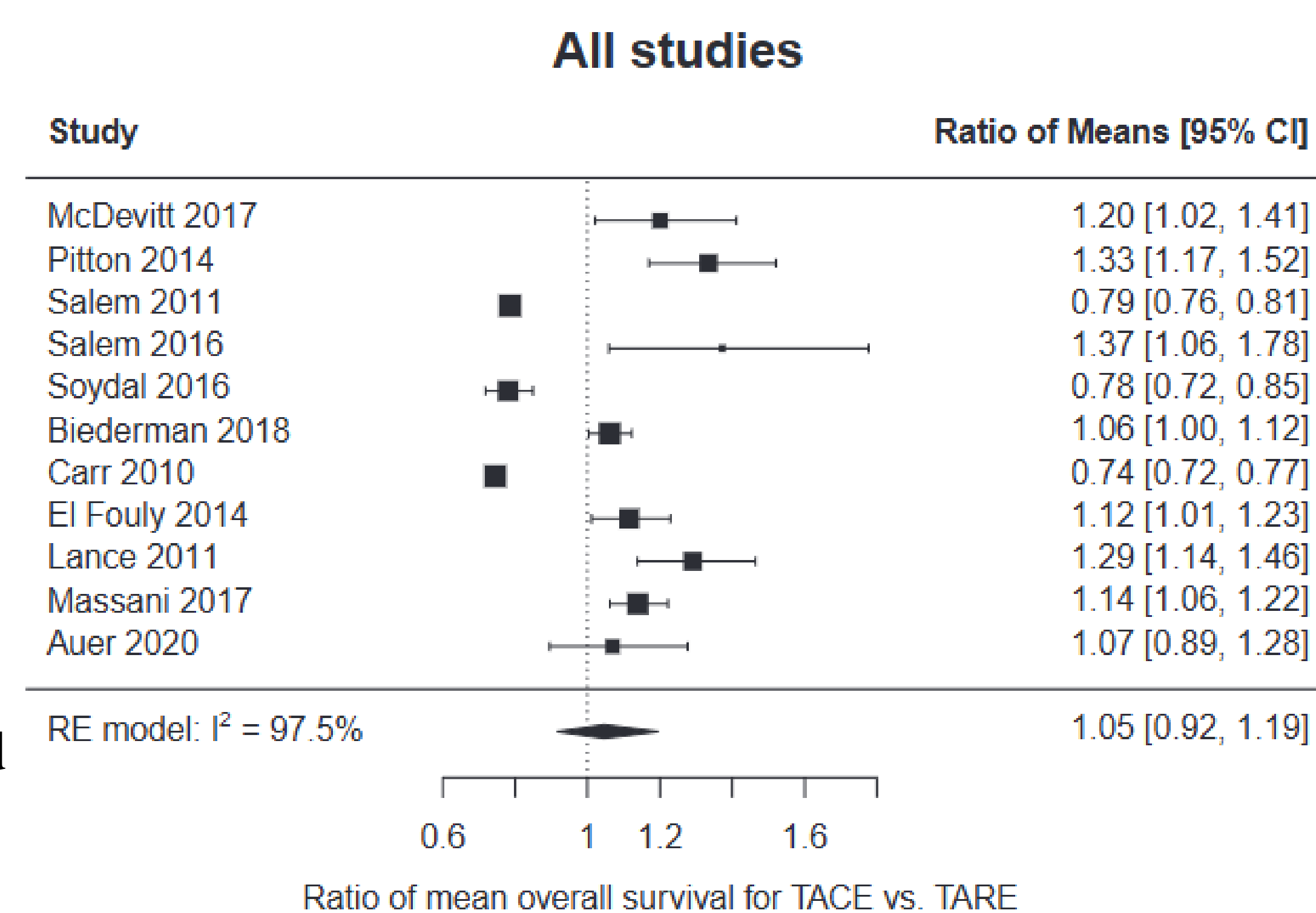


FIGURE 1. Forest plot comparing mean overall survival between transarterial chemoembolization (TACE) and transarterial radioembolization (TARE).