Background: Despite advancements in Percutaneous Coronary Intervention (PCI) technology and techniques, iatrogenic coronary artery perforation (CAP) remains a dreaded potential complication within the cardiac catheterisation laboratory. Data detailing the incidence of coronary perforation during PCI has previously been obtained from relatively small datasets. A swell of large data published in recent times provides invaluable information regarding PCI related CAP.

Purpose: COPIT is a systematic review and meta-analysis targeted at detailing the incidence, outcomes, etiology and treatment modalities of PCI related CAP including evaluation of temporal trends since the inception of PCI to contemporary practice. Additionally, COPIT provides hypothesis generating data regarding predictors of CAP during PCI.

Methods: A prospective systematic review and meta-analysis using MEDLINE and EMBASE via the OVID interface (PROSPERO ID: CRD42020207881) was performed according to the PRISMA guidelines. Identified relevant studies were used in a pre-specified sensitivity analysis to detail incidence, outcomes, etiology, treatment modalities and risk factors of PCI complicated by CAP. Studies limited to PCI in high risk populations only such as CTO-PCI or rotational atherectomy only were excluded.

Results: 67 studies met eligibility criteria detailing 5,568,191 PCIs over a 38-year period (1982–2020). The pooled incidence of CAP was 0.39% (95% CI: 0.34–0.45%) with no change in incidence over that time. Approximately 1 in 5 perforations led to cardiac tamponade (21.1%). Ellis 3 perforations are increasing in frequency and account for 43% of all perforations. Mortality due to perforation occurs in 7.5% of all CAP (95% CI 6.7% - 8.4%) but has declined over the studied period. Meta-regression suggested that female gender, hypertension, chronic kidney disease and previous coronary bypass grafting were all associated with higher incidence of CAP. Coronary perforation was most frequently caused by distal wire exit (37%) followed by balloon dilation catheters (28%). Covered stents were used to treat 25% of perforations, with emergency cardiac surgery needed in 17%. Conclusion: Coronary perforations occur in approximately 1 in 250 all-comer PCI procedures. A tendency towards increase in coronary perforations is likely reflective of contemporary trends towards high pressure post-dilatation with 1:1 vessel sizing as well as an ageing population with increasingly complex, calcific coronary disease. However, reduction in CAP related mortality suggests earlier recognition and effective treatment with transcatheter techniques.