

## Original Article

# The role of curcumin as an inhibitor of oxidative stress caused by ischaemia re-perfusion injury in tetralogy of Fallot patients undergoing corrective surgery

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**Abstract** *Background:* Cardiopulmonary bypass during tetralogy of Fallot corrective surgery is associated with oxidative stress, and contributes to peri-operative problems. Curcumin has been known as a potent scavenger of reactive oxygen species, which enhances the activity of antioxidants and suppresses phosphorylation of transcription factors involved in inflammation and apoptosis. *Objectives:* To evaluate the effects of curcumin as an antioxidant by evaluating the concentrations of malondialdehyde and glutathione, activity of nuclear factor-kappa B, c-Jun N-terminal kinase, caspase-3, and post-operative clinical outcomes. *Methods:* Tetralogy of Fallot patients for corrective surgery were randomised to receive curcumin (45 mg/day) or placebo orally for 14 days before surgery. Malondialdehyde and glutathione concentrations were evaluated during the pre-ischaemia, ischaemia, re-perfusion phases, and 6 hours after aortic clamping-off. Nuclear factor-kappa B, c-Jun N-terminal kinase, and caspase-3, taken from the infundibulum, were assessed during the pre-ischaemia, ischaemia, and re-perfusion phases. Haemodynamic parameters were monitored until day 5 after surgery. *Results:* In all the observation phases, malondialdehyde and glutathione concentrations were similar between groups. There was no significant difference in nuclear factor-kappa B activity between the groups for three observations; however, in the curcumin group, c-Jun N-terminal kinase significantly decreased from the pre-ischaemia to the re-perfusion phases, and caspase-3 expression was lower in the ischaemia phase. Patients in the curcumin group had lower temperature and better ventricular functions, but no significant differences were found in mechanical ventilation day or length of hospital stay in the two groups. *Conclusion:* Cardioprotective effects of curcumin may include inhibition of the c-Jun N-terminal kinase pathway and caspase-3 in cardiomyocytes, particularly in the ischaemia phase.

Keywords: Curcumin; ischaemia re-perfusion injury; apoptosis

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**T**ETRALOGY OF FALLOT OCCURS IN THREE OF EVERY 10,000 live births and is the most common cause of cyanotic CHD,<sup>1</sup> which requires open

heart corrective surgery. Patients who undergo tetralogy of Fallot repair are at high risk for ischaemia re-perfusion injury caused by the use of the cardiopulmonary bypass machine and sudden blood restoration after a period of aortic clamping-off.<sup>2</sup> Our study in 2013 showed that 22% of patients with tetralogy of Fallot who underwent total correction

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