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

Received: 11 August 2014; Accepted: 15 February 2015