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Effects of extended-release implant containing hydroalcoholic extract of Silybum marianum on the prevention of intra-abdominal adhesion following intra-abdominal laparotomy in rats

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Abstract:

Background and Aim: Silymarin is a collection of bioactive compounds of Silybum marianum wort that shows protective effects against intra-abdominal adhesions. The bioavailability of silymarin is relatively low and its uptake levels vary between 20-50%, so new methods need to be propo sed to improve its bioavailability. The aim of this study was to prepare and evaluate the effect of slow implant containing Silybum marianum extract on intra-abdominal adhesion.**Methods:** In the present experimental study, 4 types of implants including cross-linked chitosan implant, cross-linked chitosan implant with β-GP, non-crosslinked chitosan implant containing Silybum marianum extract and cross-linked chitosan implant with β-GP containing Silybum marianum extract were prepared. Structural properties, thickness and inflatability, pH, disintegration time, adhesion strength and release of the extract were determined in vitro. For in vivoevaluation, 48rats were divided into 6 groups of 8 including surgical group (without intervention), heparin group and groups receiving 4 types of implants. 14 days later, the amount of adhesions in the rats was determined and graded. Data were analyzed by SPSS. **Results:** SEM study showed that cross-linked implants with β-GP had less porosity than non -crosslinked implants. FT-IR also confirmed cross-linking of chitosan with β-GP. The prepared implants had a pH within the limits of normal tissue, adhesion and inflatability, and good disintegration time. In non-crosslinked implants the extract release was faster than in crosslinked implants. Treatment of rats undergoing laparotomy with heparin significantly reduced the total number of adhesion bands, the number of vascular adhesion bands and the severity of adhesion compared to the surgical group ($p < 0.05$). Treatment of rats undergoing laparotomy with non-crosslinked implants containing the extract, caused a significant reduction in the number of vascular adhesion bands compared to the surgical group ($p < 0.05$) but not a significant effect on other parameters. Crosslinked implants containing the extract did not differ significantly from the surgical group, despite the reduction in the total number of adhesive bands, the number of adhesive bands with and without vessels, and the severity of adhesions. **Conclusion:** Crosslinked chitosan implants containing Silybum marianum extract caused long-term release of the extract but had little positive effect on intra-abdominal adhesion, which was probably due to the low dose of the extract and further studies are needed to increase the dose of the extract in the implant.

Keywords: Silybum marianum, Intra-abdominal adhesion, Extended-release product, Implant, Silymarin, Rat