REPAIR EFFICIENCY OF CLINICAL ABDOMINAL HERNIAS USING DECELLULARIZED AORTIC AND DIAPHRAGMATIC MATRICES IN CATTLE

ABSTRACT

Key words: Abdominal hernias, Cattle, DAM, DDM, FTIR, Histopathology, SEM

In this study aorta and diaphragm from buffalo were decellularized, and biocompatibility was evaluated on clinical abdominal hernias in cattle. Fresh aorta was decellularized using established procedure, whereas fresh tendinous diaphragm was decellularized with different concentrations of sodium dodecyl sulphate (SDS) over a range of periods. Decellularization completeness was confirmed histologically. Prepared matrices were further characterized by Masson’s trichrome and Weigert’s staining, scanning electron microscopy (SEM), DNA quantification and Fourier transform infrared (FTIR) spectroscopy. Twelve Gir cattle with clinical abdominal hernias were assigned into two equal groups: implanted with decellularized aortic matrix (DAM) and decellularized diaphragmatic matrix (DDM). Clinical, hematological, biochemical and erythrocytic antioxidants evaluation was carried to assess healing progress. Histologically, absence of cells and orderly arranged collagen fibres were observed in aorta treated with 1 % SDS for 24 h followed by 0.25 % trypsin for 2 h and again with 1 % SDS for 24 h, and in diaphragm treated with 2 % SDS for 48 h. SEM examination confirmed preservation of collagen fibrils arrangement within prepared matrices. Decrease in DNA content was highly significant ($P < 0.001$) in DAM (6.47 ± 1.26 ng/mg) as compared to native aorta (488.11 ± 49.12 ng/mg), whereas it was significant ($P < 0.05$) in DDM (33.13 ± 5.39 ng/mg) as compared to native diaphragm (443.95 ± 162.60 ng/mg). FTIR spectra of native aorta with peaks at 3302.24, 3067.88, 1658.84, 1526.71 and 1282.55 cm$^{-1}$; DAM at 3340.82, 3057.27, 1665.59, 1529.60 and 1230.69; native diaphragm at 3386.15, 3062.10, 1664.72, 1532.39 and 1284.73 cm$^{-1}$; and DDM at 3343.71, 3081.39, 1649.19, 1597.11 and 1220.02 were similar to that of amide bonds of bovine skin collagen. Clinical, hematological, biochemical, erythrocytic antioxidants evaluation revealed uncomplicated healing of abdominal hernias in both groups. Results presented in this study proved biocompatibility of buffalo DAM and DDM for abdominal hernioplasty in cattle.