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A bioinspired switchable adhesive patch with adhesion and suction mechanisms for laparoscopic surgeries

Abstract: Medical adhesives play an important role in clinical medicine because of their flexibility and convenient operation. However, they are still limited to laparoscopic surgeries, which have demonstrated urgent demand for liver retraction with minimal damage to the human body. Here, inspired by the suction cup structure of octopus, an adhesive patch with excellent mechanical properties, robust and switchable adhesiveness, and biocompatibility is proposed. The adhesive patch is combined by the attachment body mainly made of poly(acrylic acid) grafted with N-hydroxysuccinimide ester, crosslinked biodegradable gelatin methacrylate and biodegradable biopolymer gelatin to mimic the adhesive sucker rim, and the temperature-sensitive telescopic layer of microgelcrosslinked poly(N-isopropylacrylamide-co-2-hydroxyethyl methacrylate) to shrink and form internal cavity with reduced pressure. Through mechanical tests, adhesion evaluation, and biocompatibility analysis, the bioinspired adhesive patch has demonstrated its capacity not only in adhesion to tissues but also in potential treatment for medical applications, especially laparoscopic technology. The bioinspired adhesive patch can break through the limitations of traditional retraction methods, and become an ideal candidate for liver retraction in laparoscopic surgery and related clinical medicine.

Keywords: Hydrogel Suction cup Adhesive patch Biocompatibility Liver retraction

Biography: Doctor of Ningbo University, resident physician of hepatobiliary surgery department of Li Huili, Ningbo Medical Center, mainly studies the clinical application of medical biopolymer materials and basic research of tumors.