



Contrasting agent with increased affinity and selectivity for diagnostics and surgical treatment of neoplasms of gastrointestinal tract



RNDr. PharmDr. Patrik Jakabčín and assoc. prof. RNDr. Jozef Uličný, CSc.,
Department of Biophysics, Center for Multimodal Imaging, Institute of Physics
Faculty of Science,
University of P. J. Šafárik in Košice,
and
SAFTRA IMAGINE, Ltd.
Jesenná 5
040 01 Košice
Slovakia



Actual state

Neoplasms of the gastrointestinal tract are tumor-transformed tissues which, without treatment can transform into malignant tumors. The therapy of such neoplasms is usually radical, by surgical procedure - incision of detected neoplasms. The position, shape and size of the neoplasm is typically corroborated using endoscopic method. The surgeon uses endoscopic optical probe to localize the position of such polyps along the gastrointestinal tract. The polyps which are not embedded into the deeper layers of the tissue can be removed during the same endoscopic examination session by using polypectomy, that means by application of polypectomic loop ("Jumbo biopsy" or "strip biopsy") using rigid sigmoidoscopy. These techniques, called endoscopic mucosal resection (EMR) and endoscopic resection (ER) of lift&cut type, require before the biopsy submucosal injection. The purpose of such injection is to assure the separation of neoplasm from *muscularis propria*. Such elevation of neoplasm allows then the application of polypectomic loop and control of incision process.

Our aim

to find composition of injection solution for use in diagnostics and surgical treatment of neoplasms of gastrointestinal tract, while providing increased affinity and selectivity achieving visual control of neoplasm versus healthy tissue during procedure, prolonging the applicable time window as well as increase of precision and quality of polypectomy. Better visual control during procedure allows more precise incision in the complex conditions {e.g. bad accessibility for polypectomic loop or proximity of inoperable tumor}.

Our solution

Contrasting mixture according to patent claim (submitted to Slovak patent office).
The application of our contrasting mixture to this patent claim is for diagnostics and surgical treatment of neoplasm of gastrointestinal tract. By use of this contrasting mixture, sharply distinct color boundary between the healthy tissue and the neoplastic tissue as well as the increase of volume of the neoplastic tissue and thus his elevation from the tissue of the gastrointestinal tract can be achieved for the time duration 10 – 25 minutes in visible region. The sharp distinction of the boundary is achieved due to different speed of diffusion of low molecular weight component versus the high molecular weight component in tissues. Neoplasm forms a structure where epithelial cells are mutually bound, so that the macromolecular components from the lumen of the gastrointestinal tract penetrate the wall of the neoplasm at slower rate than low molecular weight components.

Advantages

By using contrasting mixture according to this patent claim, **prolongation of the duration** of color contrasted differences between the tissues is achieved, where the contrasting is negative. By use of the contrasting mixture according to this patent claim the duration of the time window for the surgery is prolonged to 10 - 25 minutes. At the same time **sharp color differences** between the healthy and neoplastic tissue as well as the increased volume of the elevated polyp increases precision and quality of polypectomic surgery. **Better visual control** during the surgery allows for higher precision also in more complex cases such as bad accessibility of the polyp for polypectomic loop or proximity of inoperable tumor.

The prolongation of the time window for surgery **reduces time stress of the personal** as well as the **comfort for the patient** (the surgery can be done in ambulant conditions, is performed using local anesthesia under fully conscious patient). Improved visual information during the endoscopic examination and surgery reduces invasiveness of the surgical intervention (less healthy tissue removed), cognitive load of medical personnel, shortens the time of surgical intervention, minimizes the risk for patient (perforation of intestine and duodenum wall) and improves the comfort of surgeon during positioning of ligator and subsequent resection. Visual contrast allows better localization of the neoplasm and reduction of resection of healthy tissue.

Contrasting mixture according to this patent claim allows the **drop in replacement of existing contrasting solutions** without the need of change of protocol and instrumentation, while prolongating the time window suitable for surgery and improvement of the precision, while not rising the unit cost for production.

References

Patent application "Kontrastovacia zmes so zvýšenou afinitou a selektivitou na diagnostiku a chirurgickú liečbu novotvarov tráviaceho traktu a jej použitie" pending.



SAFTRA IMAGINE, Ltd. is startup company of University of P.J. Šafárik in Košice with 25% share of parent company SAFTRA, Ltd.

Patrik Jakabčín and Jozef Uličný are co-founders of the company.