Inventions and Innovations Related to Better Results in Intestinal Anastomosis: a Patent Review

REVIEW

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Abstract

Objective: To evaluate new techniques and improvements in surgical instruments related to intestinal anastomosis procedures.

Methods: A search was conducted on the free database of patents from the National Institute of Industrial Patent Office (INPI) and The United States Patent and Trademark Office (USPTO). Were analyzed all occurrences between 2012 and 2016 related to experimental surgery and intestinal anastomosis. The requests for patents were examined individually and the data collected was the nationality of the applicant, if was physical (PP) or legal (LP) person and if was innovation or invention. At the end, a comparative analysis between the two institutions was performed.

Results: In INPI was found only 5 occurrences. All of them were deposited by legal entity and were inventions. In addition, only one was a national request. In USPTO database, 65 occurrences met the inclusion criteria. Of these, 48 were national applications and only 5 were filed by physical person.

Conclusion: More requests were found in US database, predominating national trustee and greater solicitation to inventions than Brazilian database. The main applications for patents are invention of surgical instruments, the development of new biological glues and improvement of mechanical sutures.

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Keywords

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Introduction

Intestinal anastomosis has always been a great challenge for surgeons because of its potential mortality and its many complications. The surgeries performed on an urgency setting have worse results due to the presence of infection, shock, unfavorable local conditions and association with other comorbidities [1].

The development of new techniques and discovery of new materials through experimental research, such as mechanical sutures [2], harmonic scalpel [3] and biological adhesives [4, 5] were and are essential for improving outcomes.

Thus, the objective of this study was to perform a survey of all new techniques and improvements in surgical instruments since 2012 on the free database of patents from the National Institute of Industrial Patent Office (INPI) [6] and The United States Patent and Trademark Office (USPTO) [7] and perform a comparative analysis between the two institutions.

Methods

This study consists in a bibliographic analysis of exploratory study with a quantitative approach [8].

It was conducted by the international data network, using national (INPI) and international (USPTO) free databases, which were analyzed all occurrences from 2012 to 2016 related to experimental surgery and intestinal anastomosis.

Initially, in the national database, the search denominator used were the words "experimental surgery", but due to the insignificant results, it was decided to change the denominator for "anastomosis" obtaining a larger number of occurrences.

In USPTO, was used the word "anastomosis" and due to the high volume of requests, there was a need to refine the search using different denominators as "surgery", "experimental", "intestine", "suture" and "devices".

All requests for patents were analyzed individually and the data collected was the nationality of the applicant, if was physical (PP) or legal (LP) person and if was innovation or invention.

Requests not related to improved surgical technique, inventions or models of surgical instruments not related to intestinal anastomosis or requests with incomplete data were excluded from the survey.

The descriptors were search in the titles and abstract of patent requests.

Results

In the national database, was used the word "anastomosis" as search denominator and was achieved 6 requests. Among these, one was excluded for containing incomplete data, not corresponding to research's aim.

Also in INPI, of the 5 remaining cases, it was observed that all were deposited by legal entity, all being inventions. In addition, only one was a national request (**Table 1**).

Table 1. Patents nationally registered from 2012-2016.

Description	Patent N°	Filing Date	Publication Data	Inventor	Trustee	Person	Country
Anastomosis connectors	BR 11 2016 012295 0 A2	03/12/2014	14/06/2016	W.L. GORE & ASSOCIATES, INC. (US)	Tavares Propriedade Intelectual Ltda.	Legal	USA
Ultrasonic anastomosis instrument with piezoelectric head	BR 11 2016 010807 8 A2	11/11/2014	24/05/2016	ETHICON ENDO-SURGERY, LLC (PR)	Carlos Cezar Cordeiro Pires	Legal	USA

Description	Patent N°	Filing Date	Publication Data	Inventor	Trustee	Person	Country
Anastomosis instrument with a terminal piece rod	BR 11 2015 008929 1 A2	23/10/2013	05/05/2015	AESULAP AG (DE)	BHERING ADVOGADOS	Legal	Germany
Adapter with flexible tip attached to needle thread to trocater of circular stapler warhead	BR 10 2013 024695 6 A2	26/09/2013	15/09/2015	Antônio T.T. de Oliveira; Armando G.F. Melani; Croider F. Lacerda; Paulo A. Bertulucci	VILAGE MARCAS & PATENTES LTDA.	Legal	Brazil
Modular magnetic anastomosis device	BR 11 2014 000655 5 A2	11/07/2012	12/08/2014	IRCAD (FR)	Orlando de Souza	Legal	USA

Source: National Institute of Industrial Property (INPI).

In USPTO database, the word "anastomosis" was used, with the refinement of the words "intestinal", "suture" and "device", with 198 occurrences. However, only 65 met the inclusion criteria. Of these, 48 were national applications and 5 were filed by individual.

Discussion

Complications of intestinal anastomosis are a constant concern in the practice of the gastrointestinal surgeon. The development of new techniques, as well as the improvement and invention of new instruments and equipment, were responsible for the significant improvement of these results.

Analyzing the two bases of patents, it was observed a big difference in the number of requests and the origin of the applicant (national or international), which was far greater in the US database, indicating a greater culture geared not only to the discovery and development, but also to protect these projects.

In both countries surveyed, there is the same result as regards the number of applications for inventions predominating on the innovations. Legal person as trusted is also more common in both bases, probably due to the process costs associated with higher investments by companies.

In recent years, there is a major concentration in the development and improvement of mechanical sutures (staplers), laparoscopic instrumentals and biological adhesives to prevent gastrointestinal leaks [6, 7].

The use of sealants associated with staplers, anastomotic stabilization instruments, sutures with magnetized materials support [9] and new tweezers models are the main descriptions. Possibly, there will be a continuity in this line of research, because staplers are still not ideal, there are limitations of movement and handling problems of laparoscopic tweezers and there isn't a biological adhesive considered ideal yet [4, 5].

Another recent segment on improving anastomosis is robotic surgery. It is a new surgical modality that uses mechanical arms attached to various tweezers, remotely controlled by the surgeon, allowing to perform more precise surgeries with a greater range of motion and magnified view in three dimensions. The results are quite satisfactory in the urological area, specifically in prostate surgery, but recently it has been changing its focus and concentrating on the digestive tract, with quite positive results as well [10]. There are already some timid requests for patents and utility models in this area, but that will increase rapidly due to its numerous promising results.

Conclusions

Comparing the two bases of patents were found more requests in US database, predominating national trustee and greater solicitation to inventions than Brazilian base. The main applications for patents are invention of surgical instruments, the development of new biological glues and improvement of mechanical sutures.

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