**A stroll through the history of laparoscopic surgery: Dr Gagner’s contribution to this journey**

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I wrote this essay to shed some light on the history of what became a revolution in surgery, namely lapartoscopic surgery. It is difficult to talk about laparoscopic surgery without mentioning the merits of Michel Gagner. I personally have been observing and admiring the continuous rise of this star in surgery, and thought it was finally time for me to share what I have witnessed throughout the years.

Dr. Michel Gagner’s career in surgery began with a strong academic foundation. He completed his medical degree at the Université de Sherbrooke in Quebec, Canada, where he was exposed to a wide array of medical disciplines, laying the groundwork for his interest in surgery. Following his medical degree, he pursued surgical residency at McGill University in Montreal, one of Canada’s premier institutions for surgical training. During his residency, Dr. Gagner developed a particular interest in gastrointestinal surgery, which at the time was dominated by traditional open surgical techniques.

The 1980s marked a period of rapid development in surgical technology, and Dr. Gagner was exposed to some of the early attempts to minimize the invasiveness of surgical procedures. His residency provided him with a solid base of traditional surgical methods. It was his fellowship at the Cleveland Clinic in the United States, one of the leading centers for surgical innovation, that broadened his exposure to advanced techniques. During his fellowship in surgical oncology and hepatobiliary surgery, he was introduced to some of the early iterations of minimally invasive procedures, some of which quite unexpected. It was at this stage that Dr. Gagner started recognizing the potential for laparoscopic surgery, which was just beginning to emerge as a viable alternative to open surgery. Thankfully, Michel’s early mentors were leaders in the field of gastrointestinal surgery, and they encouraged innovation while maintaining a rigorous focus on patient outcomes. These mentors, along with his contemporaries, helped foster an environment of curiosity and experimentation that was crucial for the development of new surgical techniques and that deeply influenced the young Michel Gagner. Exposure to pioneers of early laparoscopic surgery further deepened his interest in this evolving field. His background in gastrointestinal and hepatobiliary surgery positioned him well to explore minimally invasive approaches to complex surgeries, which were typically performed through large incisions at that time.

The late 1980s and early 1990s were transformative years for surgery, marked by the introduction of operative laparoscopy outside of the domain of gynecology, that up to that time had substantially monopolized the technique.Dr. Gagner's introduction to minimally invasive surgery occurred during this critical period, when laparoscopic cholecystectomy was gaining popularity as the first widely adopted laparoscopic procedure.No doubt, Dr Gagner’s good terms with the French pioneers, including Drs Mouret and Dubois, who initiated the widespread interest in the brand new technique, stimulated him in the exploration of operative laparoscopy. The success of laparoscopic cholecystectomy, which dramatically reduced patient recovery time and postoperative pain, sparked his interest in applying laparoscopic techniques to other types of surgery.

Gagner, working in an era where most surgeries were still performed using open methods, quickly recognized the potential advantages of laparoscopy and demonstrated that complex surgeries could be accomplished with less trauma to the patient thanks to the laparoscopic approach. This paradigm shift challenged long-held beliefs about the necessity of large incisions for visualizing and accessing internal organs. Inspired by these early successes, Michel sought to apply the same principles of laparoscopy to gastrointestinal and bariatric surgery, areas where he had already developed substantial expertise.

In his early explorations, Dr. Gagner faced significant technical challenges. Instruments for laparoscopic surgery were in their infancy, not to mention that many surgeons were skeptical about the feasibility of using these techniques for surgeries with any complexity beyond cholecystectomy. Despite this, he persisted, driven by the belief that minimally invasive surgery had the potential to revolutionize patient care by reducing postoperative pain, shortening hospital stays, and minimizing complications such as infections and hernias, all advantages that nowadays are self-evident. Quite importantly, his early experiences included adapting available instruments and techniques to perform more intricate procedures, which set the stage for the innovations that would follow in bariatric and metabolic surgery.

In the mean time, Dr. Gagner began collaborating with other surgeons interested in minimally invasive techniques. I would like to mention Dr Guy-Bernard Cadière, from Brussels, and, in the USA, Drs Alphons Pomp and Manish Parikh, hard working “early believers”who stimulated the giant progression of laparoscopy. These collaborations allowed for the exchange of ideas and the development of new surgical strategies. His interest in laparoscopic surgery was fueled by the growing body of evidence that suggested it could offer significant benefits over traditional open surgery. His exposure to laparoscopic techniques during this formative period not only influenced his surgical practice but also sparked his career-long commitment to advancing minimally invasive approaches.

Stimulated by the approval of his visionary colleagues, scattered all over the world, his early experiences laid the foundation for his later work, particularly in the development of laparoscopic procedures for complex surgeries, including bariatric and metabolic surgeries. His pioneering efforts were part of a broader movement that sought to push the boundaries of what was possible with minimally invasive surgery, paving the way for widespread adoption of laparoscopic techniques across various surgical specialties, including the surgical treatment of the patient suffering from severe obesity, i.e. bariatric surgery.

Before the advent of laparoscopic techniques, bariatric surgery was primarily performed as an open procedure, requiring large incisions allowing the difficult access to the abdominal cavity, hindered by substantial layers of adipose tissue. Open procedures, such as the open gastric bypass and the duodenal switch, were effective in achieving substantial weight loss for patients with severe obesity but were associated with significant risks, including prolonged recovery times, increased postoperative pain, and specific complications such as wound infections, hernias, and deep vein thrombosis. Furthermore, the large incisions required for open bariatric surgery increased the chances of developing incisional hernias, which often required additional complex surgical interventions.

Dr. Gagner’s groundbreaking work in the late 1990s and early 2000s focused on minimizing these risks through the development and refinement of laparoscopic bariatric surgery. One of his most significant contributions was the first laparoscopic duodenal switch -a modification of the biliopancreatic diversion (BPD)-, a complex but effective procedure, that appeared to many surgeons as a technically impossible task to achieve.

Hence, when Dr. Gagner performed the first laparoscopic duodenal switch in 1999, this marked a pivotal moment in bariatric surgery, as it demonstrated that even the most complex bariatric procedures could be safely performed using minimally invasive techniques. It became clear that the laparoscopic technique minimized the risk of wound-related complications, which were common in open surgery. Dr. Gagner's success with the laparoscopic duodenal switch paved the way for the widespread adoption of minimally invasive techniques in bariatric surgery and inspired further innovation in this field.

The performance of the duodenal switch by strict laparoscopic means was a historically groundbreaking achievement, because of the fact that the procedure encompassed a sleeve gastrectomy, which would later appear to be a game changer in bariatric surgery. While the sleeve gastrectomy was conceived as integral part of the duodenal switch, in his continued efforts to reduce the surgical morbidity Gagner invented the concept of staging the duodenal switch (separating the relatively “easy” sleeve gastrectomy from the more demanding and dangerous duodenal section and anastomosis with the ileum, that would be performed separately, after sizeable weight had been shed, and the operative risks decreased).

Surely enough, for many patients, the isolated sleeve gastrectomy produced significant weight loss and improvements in obesity-related comorbidities, such as type 2 diabetes and hypertension. As a result, the procedure began to be considered a standalone standard bariatric surgery. Dr. Gagner's contributions to the refinement of this technique helped standardize the laparoscopic sleeve gastrectomy, which has since become one of the most commonly performed bariatric surgeries worldwide.

Gagner was and continues to be convinced that laparoscopic sleeve gastrectomy offers numerous advantages over other bariatric procedures. It is obviously technically simpler than the duodenal switch but also than other bariatric techniques such as the gastric bypass because it involves fewer anastomoses, and carries a lower risk of malabsorption-related complications. Additionally, the sleeve gastrectomy retains the pylorus, which helps preserve normal gastric emptying, reducing the risk of dumping syndrome.

Despite the undeniable long-term unwanted side-effects, especially gastro-esophageal reflux, Gagner remains convinced that the benefits of the sleeve gasttrectomly surpass the downsides, which makes it , so far, the “best available traditional bariatric operation.”

Gagner’s research has focused not only on the technical aspects of these surgeries but also on their long-term outcomes, particularly in relation to type 2 diabetes. His work has contributed to the growing body of evidence suggesting that bariatric surgery leads to significant improvements in glucose metabolism, independent of weight loss. These findings have had important implications for the use of bariatric surgery as a treatment for metabolic disorders, leading to the development of metabolic surgery -a term first used by Dr Buchwald-, as a subspecialty.

This shift in understanding helped reposition “bariatric” procedures as metabolic interventions, rather than purely weight-loss surgeries, thus expanding the potential therapeutic applications of these techniques. Dr. Gagner has been at the forefront of research investigating the hormonal and metabolic changes that occur following bariatric and metabolic surgeries. His studies, along with those of his collaborators, have shed light on the complex physiological mechanisms that are activated following surgical interventions. One of the most significant findings from this body of research is the role of gastrointestinal hormones, such as GLP-1 (glucagon-like peptide-1) and ghrelin, in regulating appetite, insulin secretion, and glucose metabolism.

Consequently, certain bariatric procedures, especially the ones involving bypassing the duodenum, lead to profound alterations in the hormonal milieu, which contribute to improved glycemic control and even remission of type 2 diabetes in some patients. As mentioned previously, these hormonal changes occur independently of weight loss, suggesting that the rerouting of the gastrointestinal tract plays a critical role in altering metabolic function. By advancing the understanding of these mechanisms, Dr. Gagner’s research has highlighted the potential for metabolic surgery to be used as a targeted therapy for metabolic disorders.

The broader implications of this research are profound, as it has redefined the scope of bariatric surgery and provided a scientific rationale for its use in treating metabolic diseases. His clinical trials and outcome studies have helped to establish laparoscopic bariatric surgery as a safe and effective treatment for obesity and its related comorbidities. As a result, laparoscopic techniques have gained widespread acceptance and adoption in bariatric surgery worldwide. Importantly, his work has significantly contributed to the development of guidelines and best practices for performing these procedures, ensuring that patients receive high-quality care regardless of wherever in the world they undergo surgery.

Dr. Gagner’s influence extends beyond the operating room and research laboratory, as he has played a crucial role in educating and training the next generation of surgeons in laparoscopic and metabolic surgery. As a professor and surgeon at prestigious institutions, including McGill University and Mount Sinai Medical Center, Dr. Gagner has mentored countless surgical trainees, imparting his expertise in minimally invasive techniques and encouraging innovation in the field. His leadership in surgical education has helped disseminate laparoscopic skills across the globe, particularly in the rapidly growing field of bariatric and metabolic surgery.

In addition to his academic roles, Dr. Gagner has been instrumental in organizing training programs, workshops, and symposia aimed at equipping surgeons with the skills necessary to perform complex laparoscopic procedures. These programs have not only expanded access to minimally invasive surgery but have also raised the standard of care by ensuring that surgeons are trained to the highest levels of proficiency. His commitment to education has had a lasting impact on the global surgical community, enabling the widespread adoption of laparoscopic techniques and improving patient outcomes worldwide..

I would like to partcularly emphasize that Dr Gagner has always been a vocal advocate for patient safety and the ethical practice of minimally invasive surgery. He has emphasized the importance of thorough training and the need for a standardized approach to surgical care to ensure that patients receive the highest level of treatment regardless of where they are located. His global advocacy has helped to establish guidelines and recommendations that prioritize patient safety and foster the responsible adoption of laparoscopic techniques in diverse healthcare settings.

In addition to his work in traditional laparoscopic surgery, Dr. Gagner has been a pioneer in the integration of robotic-assisted surgery into minimally invasive techniques. He has explored the potential of robotic surgery in bariatric and metabolic procedures, demonstrating how this technology can complement traditional laparoscopic approaches by enabling more precise dissection and suturing in anatomically challenging areas. Robotic surgery, as advocated by Dr. Gagner, represents the next frontier in the evolution of minimally invasive techniques, offering the potential to improve surgical outcomes and expand the range of procedures that can be performed using minimally invasive approaches.

Looking ahead, Dr. Gagner’s contributions to surgical innovation continue to shape the future of the field. His research interests have expanded to include emerging technologies such as artificial intelligence (AI) and machine learning, which have the potential to revolutionize surgery by providing real-time decision support, enhancing image analysis, and optimizing surgical planning. Dr. Gagner’s ongoing work aims to integrate these technologies into minimally invasive and robotic surgery to further improve precision, safety, and patient outcomes. A recent field of research and expertise encompasses the use of magnets to perform gastro-intestinal anastomoses , such as the duodeno-ileal anastomosis, soon to be performed without any incision.

His efforts to continue his research in a field that many have qualified as completed must be seen in the context of the persisting challenges of laparoscopic surgery. Complications such as internal hernias, leaks, and anastomotic strictures are inherent risks in bariatric and metabolic surgeries, particularly when performed laparoscopically. Critics of the rapid adoption of laparoscopic techniques have raised concerns about the lack of long-term data on outcomes and the steep learning curve associated with these procedures. Dr. Gagner has responded to these criticisms by advocating for rigorous training, the collection of long-term outcome data, and continuous quality improvement in surgical practice. His work has helped to address these concerns by emphasizing the importance of ongoing research and education to ensure that laparoscopic surgery remains indeed a safe and effective option for patients.

**Conclusion**

Dr. Michel Gagner's contributions to laparoscopic surgery, particularly in bariatric and metabolic procedures, have revolutionized the field of surgery. His pioneering work has transformed patient care by making minimally invasive techniques more accessible. His innovations and advocacy will remain foundational in shaping the future trajectory of these advanced surgical techniques. His commitment to research, education, and ethical practice ensures that his impact on the global surgical community will endure for generations to come.

*This dissertation was written without any particular demand from any party. I have no conflict of interest of any kind.*