

Minimal Intervention: The Next Frontier

By Rita Zakher, DMD, MBA

Introduction

During the last 20 years, minimally invasive surgery (MIS) has influenced the techniques used in every specialty of surgical medicine. In the continuing quest to maximize healthy tissue preservation, MIS is going to be the next big thing in Dentistry too!

MIS has increasingly become the “gold standard” in many surgical procedures and with increased patient awareness and demand, minimal intervention will become the key to assuring patient retention and growth in dentistry as well.

Let us begin by examining how MIS is changing the ways surgery is practiced in the medical field.

There are two basic ways to do surgery. In **open surgery**, the surgeon makes a large incision to look and work directly inside the body. In **laparoscopy (minimally invasive surgery)**, the surgeon makes one or more small incisions and inserts a light and a camera into the openings. Many types of open surgical procedures can now be done laparoscopically.

This development has not only led to the replacement of conventional procedures with minimally invasive ones, but has also stimulated surgeons to reevaluate conventional approaches with regard to perioperative parameters such as pain medication. Minimally invasive techniques have resulted in better outcomes, speedy patient recovery, smaller incisions, more healthy tissue preserved, less blood loss (and less need for transfusions), less pain and shorter hospitalizations. They are also generally less expensive than open surgery.

The shortening of the hospitalization period has led to increasing use of outpatient laparoscopic surgery, and many centers specializing in day-care surgery are using these techniques. These innovative techniques have been clinically validated as an alternative to conventional surgery for many patients. For some procedures like appendix removal and gallbladder removal, a minimally invasive approach has become the “gold standard.”

Minimally invasive surgical techniques are thus now fully established in routine use, and the indications are continuing to expand.

One of the best examples of the benefits of minimally invasive surgery (MIS) involves appendectomy surgery. In a 2004 study by Glasgow, Adamson and Mulvihill titled "The benefits of a dedicated minimally invasive surgery program to academic general surgery practice." the authors found out that whereas in 1999 only 30% of appendectomies were laparoscopic the number increased to 92% in 2003.

This increase in the rate of laparoscopic appendectomy resulted in a decrease in average length of hospital stay for all patients with acute appendicitis, from 5.5 days in 1999 to 2.7 days in 2003, and a decrease in total hospital cost per case, from \$6569 in 1999 to \$4819 in 2002. Total operating room time per case for cholecystectomy decreased from 131 to 108 minutes, and actual surgery time decreased from 95 to 74 minutes. Implementation of a dedicated MIS program resulted in a significant increase in the number of MIS cases and percentage of general surgery cases performed by MIS. This increase in the utilization of MIS resulted in reduced length of stay and cost and has been accompanied by improvements in operating room efficiency. Changes in practice associated with development of an MIS program have had measurable institutional benefits.

The need for better outcomes and value-based medicine is driving change in the health care industry. At the same time, with the proliferation of specialized medical knowledge through the internet, patients are also becoming more aware of their treatment options. It is therefore no surprise that more and more patients are asking their doctors about these less invasive techniques. Each of the stakeholders (patients, clinicians, providers, and payers) benefit from minimally invasive surgery. Shorter hospital stays and faster recovery allow patients to return to their life sooner and be productive again. Shorter hospital stays may also save on hospital expenditures, including nursing, pharmaceutical, and other associated care costs. According to Ethicon US, LLC, more than 20 million Americans have had minimally invasive procedures at some time in their life.

Minimally Invasive Surgery is therefore well established in the medical profession. But how about Minimally Invasive Dentistry? What is it about, and at what stage is it in our

profession? The phrase Minimally Invasive Dentistry has filled journals, product advertisements, and lectures around the globe over the last few years.

The concept of Minimally Invasive Dentistry supports a systematic respect for the original tissue, including diagnosis, risk assessment, preventive treatment and minimal tissue removal upon restoration, resulting in maximum healthy tissue preservation.

The concept translates:

- From a correct diagnosis of risk and lesion assessment;
- The institution of targeted preventive treatment to stop disease;
- Restoration of lesions with as little removal of healthy tissue as possible;
- The use of durable materials;
- The prevention of disease recurring

Minimally Invasive Dentistry is a concept that embraces all aspects of the profession. The common delineator is tissue preservation, preferably by preventing disease from occurring and intercepting its progress, but also removing and replacing with as little tissue loss as possible, thus maximizing healthy tissue preservation.

Dental patients, who are the same as general surgery patients, are now also expecting and demanding minimally invasive dental surgical procedures. If a procedure can be done equally well in a minimally invasive way as compared to a conventional way, patients will demand the minimally invasive procedure. It is therefore consumer demand that drives the need for dentists to quickly familiarize themselves with these techniques and begin offering them in their clinics. It is a trend that is consumer driven. In the eyes of the patient these techniques are becoming the “gold standard” in dentistry and will be a driving force in revenue increase and patient retention in the future.

Regarding caries - the most prevalent dental disease - Minimal Invasive Dentistry can best be defined as the management of caries with a biological approach, rather than with a traditional (surgical) operative dentistry approach. Where operative dentistry is required, this is now more and more carried out in the most conservative manner with minimal destruction of tooth structure. This new approach to caries management changes the emphasis from diagnosing carious lesions as cavities (and a repeating cycle of restorations), to one of diagnosing the oral ecological imbalance and effecting biological changes in the biofilm. The goal of Minimal Invasive Dentistry is to stop the disease process and then to restore lost tooth structure and function, maximizing the healing potential of the tooth. The thought process which underpins this new minimal invasive approach can be organized into three main categories: (1) Recognize, which means identify patient caries risk, (2) Remineralize, which means prevent caries and

reverse non-cavitated caries, and (3) Repair, which means control caries activity, maximize healing and repair the damage.

During the past few decades, scientific developments in cariology, dental materials and diagnostic systems have changed dentistry's approach to diagnosis and management of dental caries.

Dental adhesives and restorative materials, new understanding of the caries process and remineralization, and changes in caries prevalence have catalyzed the evolution in caries management from G.V. Black's "extension for prevention" to "minimally invasive."

Historically, dentists have been hindered in their ability to preserve tooth structure by an incomplete understanding of the caries process and deficiencies in the available restorative materials. Another important limitation, which continues to affect decisions to restore rather than monitor carious lesions over time, is the ability to detect the earliest signs of disease. The accuracy of dental radiographs and visual inspection when used for caries detection is insufficient. Research is ongoing to improve methods of early caries detection to allow us to fully implement new approaches to the management of dental caries.¹ In addition, new caries management protocols have been developed that differentiate between people with different levels of caries risk.^{2,3}

Minimal cavity designs

Preservation of natural tooth structure should be the guiding factor for the smallest, as well as the largest, cavity. Traditional cavity preparations were designed at a time when carious lesions usually were diagnosed at a more advanced state than are the incipient lesions dentists detect today. Preparations also were designed for amalgam rather than for adhesive materials, and instrumentation was limited to slow rotary instruments and hand instruments. Technological improvements in high-speed rotary handpieces, bur design, materials and early detection of lesions allow much more conservative preparation designs than those taught in the past.

Miles Markley, one of several great leaders in preventive dentistry, summarized in this statement the central concept in the modern approach to the dentist's role in the treatment of dental caries: that the loss of even a part of a human tooth should be considered "a serious injury," and that dentistry's goal should be to preserve healthy, natural tooth structure. His words are perhaps even more relevant today than when he wrote them half a century ago, now that we have the scientific understanding and the means to realize his vision.

The "minimally invasive" approach to treating dental caries incorporates the dental science of detecting, diagnosing, intercepting and treating dental caries on the

microscopic level. This approach to treating dental caries includes many non-surgical modalities, as well as the key concept that dental caries should be treated as an infectious disease. In the past, dentistry's approach to treating caries has been surgical—removing diseased tissue and replacing it with a dental restorative material. This approach was necessary, given the prevalence of disease, our understanding of the disease process, the limitations of available materials and the lack of proven alternative therapies.

Conclusion

Minimally Invasive Dentistry is gratifying for dentists and more and more demanded by patients, the same way they demand minimally invasive surgery from their surgeon.

Today, we have the knowledge, ability and interest to practice Minimally Invasive Dentistry. Even though many of us already do, the concept is not yet fully established in the profession. It is not quite yet the standard of care, but it *will* become in the following years as more and more patients demand it.

Those who do not embrace this concept will wonder why patients have abandoned them, and those who have embraced it will thrive. In the end, both patients and the dental profession will benefit. It is clearly a win-win situation for both parties.

References

1. Murdoch-Kinch CA. Oral medicine: advances in diagnostic procedures. J Calif Dent Assoc 1999;27(10):773-80, 782-4.
2. Benn DK, Clark TD, Dankel DD 2nd, Kostewicz SH. Practical approach to evidence-based management of caries. J Am Coll Dent 1999;66(1):27-35.
3. Summitt JB. Conservative cavity preparations. Dent Clin North Am 2002;46(2):171-84.