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Short Communication

Minimally Invasive Robotic Surgery Conducts to the Transoral Robotic Surgery (TORS)

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Doctors start their careers in medicine to help patients. Therefore, if the tools such as robotics can help them deliver excellent results, they will accept them with great enthusiasm. The field of medicine and technology continue to evolve at a rapid rate and the future bring many new and attractive software, computer-assisted technologies, such as Artificial Intelligence, Augmented Reality, Virtual Reality, Teledentistry and Computer-assisted surgery. With advances in new software technology, head and neck health problems can be caught earlier and start resolving problems quicker. The solutions to provide improved health care instruments are more promising than in the last decade. Dentists and patients benefit from the advances in health care technologies [1], particularly for the head and neck area. Due to these advancements, the healthcare industry is eager to produce minimally invasive surgery robots (MIS) and is growing rapidly [2]. Nowadays, new advance digital technologies that might be used in the dental clinic include countless apparatus such as cone beam CT, digital X-rays, CAD/CAM (computer-assisted design, computer-assisted prosthodontic manufacturing), dental lasers, intra-oral camera and optical scanners etc. New advanced robotics can be used in various dental treatments and oral surgeries, to assist and enhance surgeons' learning curve, knowledge and treatment awareness.

Robotics is a difficult technology that will change diagnostics and treatment protocols in general medicine and specific areas such as maxillofacial, ENT and oral surgery [3]. Robots can do repeatedly, precisely performing workflows for an indefinite length of time while enhancing the comprehensive quality and quantity of patients treatment. Robots protect surgeons to reduce ergonomic problems. In the first, initial creations, human operator-controlled robots. However, robotic systems have advanced significantly over the past years, and the latest medical robots can perform patient intervention even remotely and monitored independently. Unfortunately, limited research data on the therapeutic reliability and precision of software-controlled robots, are available so far.

Transoral Robotic Surgery (TORS) and transnasal skull base surgery, represent the pillars of robotic surgery within the ENT, head and neck pathologies and presently is used to evaluate access to the skull base and nasopharynx, such as in the Obstructive sleep apnea treatment, Nasopharyngoscopy, lateral oropharyngectomy, tongue base mucosectomy and partial supraglottic laryngectomy. During the last decade, TORS has been used in head and neck oncology for the removal of pharyngeal and laryngeal cancers [4] to improve functional and aesthetic outcomes of the patients, without worsening the postoperative complications, survival and mortality. In the robotic surgery of TORS, robotics can improve accuracy, workflows and precision, and significantly upgrade patients outcomes. Problems with contemporary solutions are the "narrow funnel effect" seen when attempting skull base surgical approaches, or where robotic arms collide due to ports placed in close proximity [5].

Contrary to the MIS, an Open surgical clinical approach to the oropharynx can be associated with complications and morbidities such as esthetics deformity, malocclusion and dysphagia. Bleeding, nerve damage and implant failure can occur and this is where robotics and

navigational surgery technologies can help by upgrading success rates and guiding the surgeon during the different implantable procedures with enhanced precision, consistency and benefit to the patient.

Clinical cases experience and scientific literature reports exist (Figure 1) but are still inconsiderable. With many interesting robotics initiatives announced, however, the overall quality of the literature, in terms of surgical validation, is bottom lined. Scientific evidence regarding the outcomes, results, benefits, and cost-efficiency of commercially available robotic solutions in TORS is not convincing. Fortunately, in general MIS and robotic surgery, TORS has raised huge interest in clinical and research environments as documented in the bibliometric results scheme (Figure 1). This is a systematic, bibliometric literature search to provide functional and practical solutions for the future and, to strongly encourage an evidence-based (EB) approach to the TORS when adapting to new TORS technology in ENT, head and neck surgery.

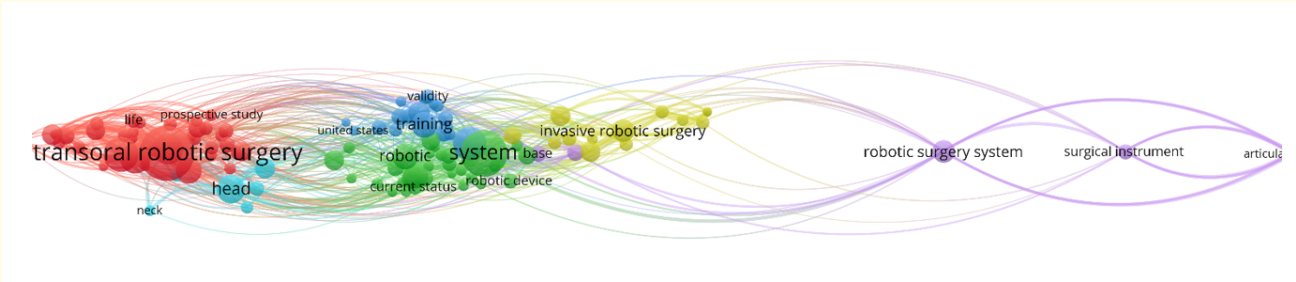

Figure 1: *Bibliometric literature search to provide functional and practical solutions and approach to the TORS technology in ENT, head and neck surgery.*

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