

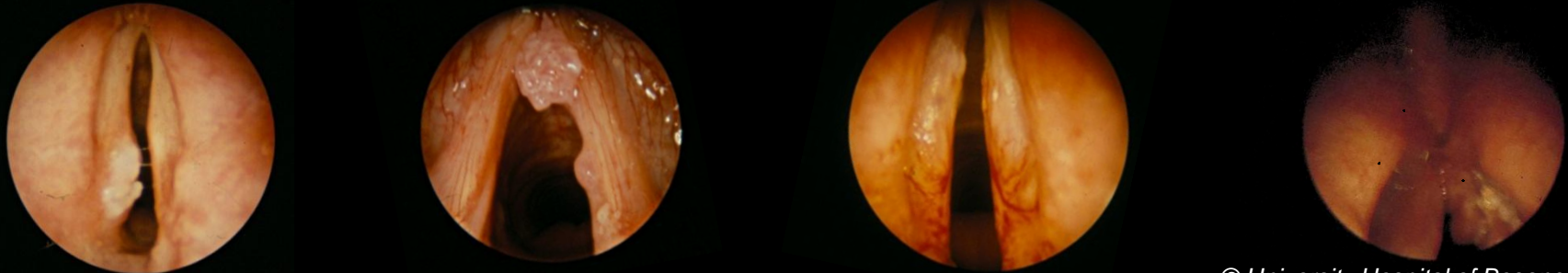
Short-term advantages and disadvantages of various types of surgery on vocal folds cancer: a user point of view

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Evolution of laryngeal cancer treatment

Aim: to maintain maximum functionality of the larynx



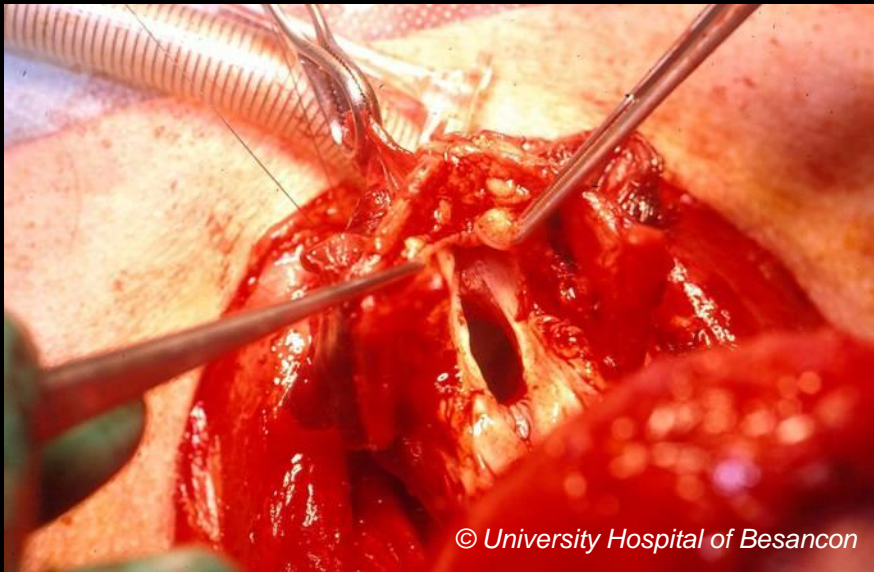
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1. **Open surgery:** partial (for early cancer) and total laryngectomy followed by adjuvant RT for advanced cancer
2. **Transoral Microscopic Surgery (TOMS):** cordectomy using laryngoscope, microscope, and CO₂ laser
→ **gold standard in the management of laryngeal lesions**
3. **Transoral Robotic Surgery (TORS):** an emerging treatment

Weinstein GS, O'Malley Jr BS, Desai SC, Quon H; Transoral robotic surgery: does the ends justify the means ? Current Opinion in Otolaryngology & Head and Neck Surgery, 17:126–131, 2009

Open surgery

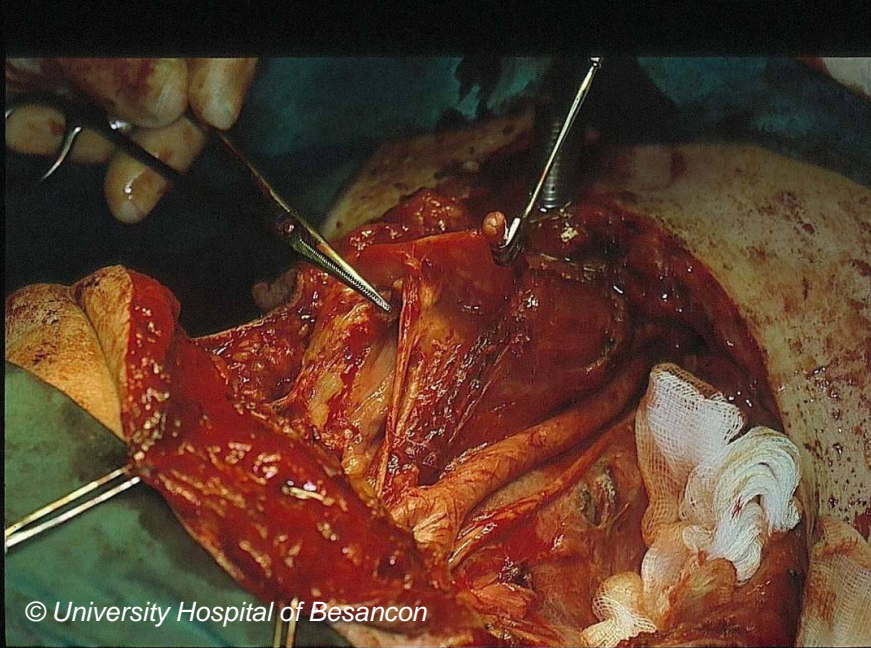
Advantages



- Allows a clear view on the endolarynx
- Able to reach unattainable area
- Able to address any sized lesion
- Able to clearly see the margins of resection
- Able to simultaneously address any neck disease
- Removal of some friable lesions
- Allows some palpation of anatomical elements

Open surgery

Disadvantages



- Very invasive with long incision be made across the lip and jaw to access the tumor
- High complication rates (bleeding, infection)
- Longest hospital stay
- Pain control more difficult
- The glottic closure reflex is ineffective for at least three weeks.
- The sensory deficit creates by the superior laryngeal nerve section is final

Brasnu D. Conservation laryngeal surgery: from open surgery to minimally invasive techniques. e-mémoire de l'Académie Nationale de Chirurgie, 2010, 9 (4) : 077-081

Microscopic surgery

Advantages



© Siteman Cancer Center at Barnes-Jewish Hospital and Washington University School of Medicine

- No incisions involved
- Similar cure rates to open surgery
- Short hospital stay
- Minimization of need for chemoradiotherapy
- Lower complication rates (bleeding, gastrostomy, infection)
- Preservation of muscles, hyoid bone and superior laryngeal nerves, facilitating swallowing.
- Preservation of the proprioceptive sensitivity of the floor allowing supraglottic laryngeal sphincter to maintain its function
- Recovery of swallowing and phonation on the day of the intervention
- No tracheostomy or feeding tube

Microscopic surgery

Disadvantages



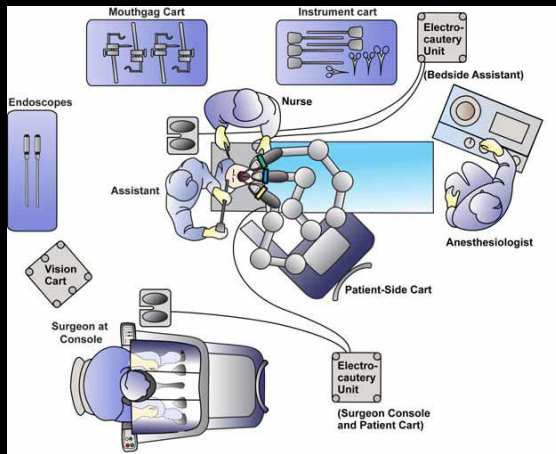
- Limited access to the anatomical region of interest
- Poor visualization,
- Decreased surgical precision
- Not able to handle tumors larger than about 3-4cm
- Harmful to surrounding healthy tissue (and in depth)
- Requires resection of sound structures to expose the tumor (ex: to reach anterior commissure)
- Expose burns to healthy tissue
- Laser shot on the probe with a higher risk of perforation leading to a leak of anesthetic gases and an explosive risk

Silver CE, Beitler JJ, Shaha AR, & al. Current trends in initial management of laryngeal cancer: the declining use of open surgery. *Eur Arch Otorhinolaryngol.* 2009 Sep;266(9):1333-52

TransOral Robotic Surgery

Historical development of robotic surgery

- Only one robot: *da vinci*[®], *intuitive surgical*



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- 1997: first use of robot in surgery: laparoscopy
- Then: thoracic, gynecology, orthopedy, UROLOGY
- 2000: FDA approval for laparoscopy



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- **Development of ENT robotic surgery → TORS:**
 - 2003: demonstration on animals and cadavers
 - 2006: first case of human use
 - 2010 (january): FDA approval for: benign and selected malignant tumors



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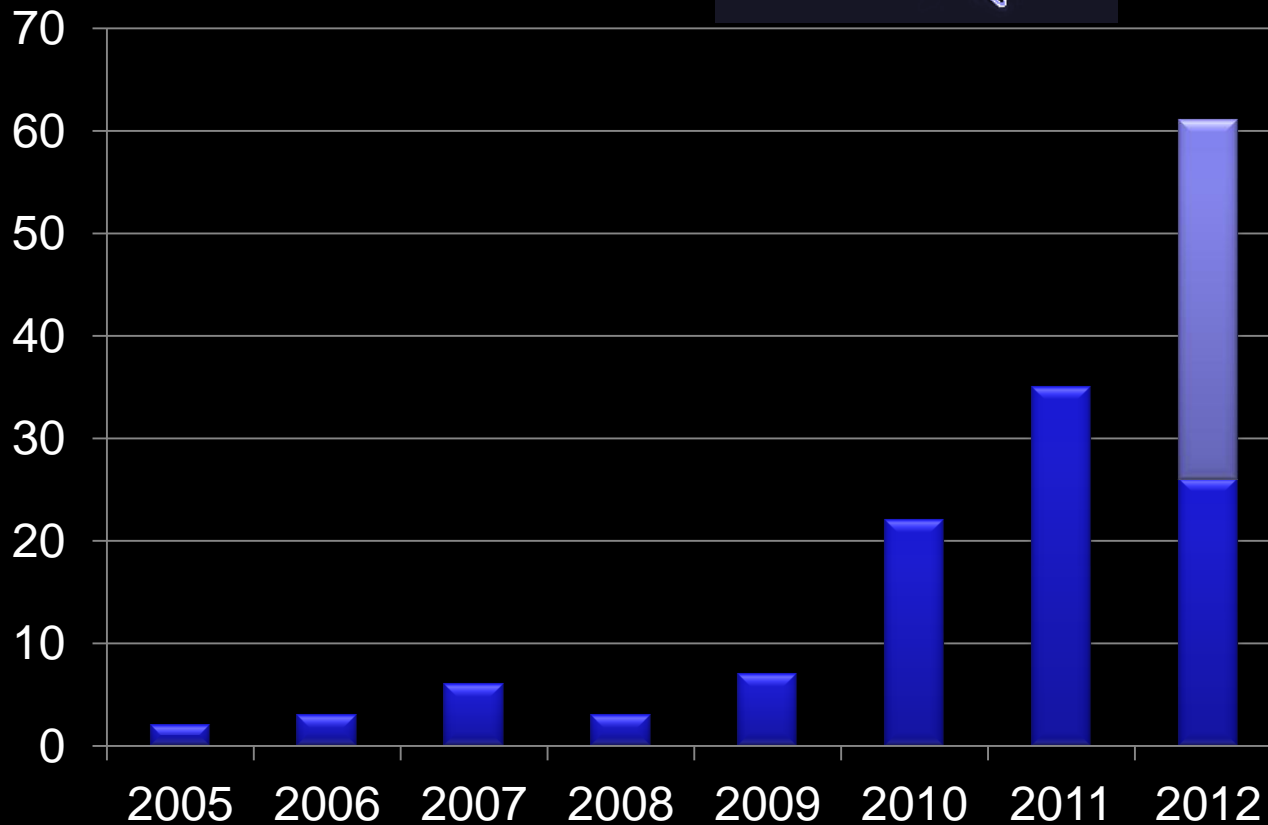


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TransOral Robotic Surgery

Evolution of the number of articles identified on PubMed



TransOral Robotic Surgery

da Vinci® TORS applications

Larynx and hypopharynx

- Supraglottis
- Glottis
- Pyriform sinus
- Pharyngeal wall

Oropharynx and skull base

- Tonsil
- Tongue base
- Palate
- Pharyngeal wall
- Parapharyngeal space

TransOral Robotic Surgery

Advantages



- Same than TLS
- A unique quality of vision in three dimensions and high definition with magnification multiplied by a factor ten, vision is stable
- The gesture is more accurate and finer, eliminating physiological tremor.
- Greater freedom in the 3 space axes
- With the angled telescopes and wristed instrument, issues of line-of-sight required for TLS are eliminated
- Better ergonomics for the surgeon who sits at the console

© Intuitive Surgical, Inc.

- Dowthwaite SA, Franklin JH, Palma DA, & al. The role of transoral robotic surgery in the management of oropharyngeal cancer: a review of the literature. *ISRN Oncol.* 2012;2012:945162.
- Van Abel KM, Moore EJ. The rise of transoral robotic surgery in the head and neck: emerging applications. *Expert Rev Anticancer Ther.* 2012 Mar;12(3):373-80.

TransOral Robotic Surgery

Disadvantages



- Purchase price of the robot, & maintenance
- Limited use & size of instruments
- No tactile recognition of the current model,
- Need of an assistant surgeon at the patient's head (to palpate some anatomical structures, to aspirate bleeding, to achieve hemostasis etc.).
- Space of reduced volume (large instruments and video-endoscope)
- Electrocoagulation & ultracision generate a thermal effect in depth,
- Poor exposure of the operative field
- Need of specific training of the team (surgical and operating room team)
- Not adapted to every patient's conformation

Conclusions 1/2

Initially based on a derivative use of preexisting da Vinci surgical system (Intuitive Surgical, Inc) (Weinstein 2009), the introduction of transoral robotic surgery in head and neck surgery brings the advantages of **three-dimensional magnification**, **increased degrees of freedom** with the effector arms, and an articulating distal end that **mimics hand movements** (Van Abel 2012).

The use of robotics in the field of head and neck surgery has provided surgeons with the *ability to access anatomic locations that were previously only managed via open techniques*. This has resulted in decreased overall morbidity, excellent functional results and the promise of **equivalent oncologic outcomes**. A recent review of preliminary studies (only case series reports) has demonstrated good oncologic and functional outcomes (Dowthwaite 2012).



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Conclusions 2/2

TORS remains a surgical instrument that *requires sound surgical skill, clinical judgment and oncologic principles*, and should be chosen based on the needs of the individual patient and the comfort of the treating surgeon.

Although the da Vinci® offers clear surgical advantages over traditional endoscopic approaches, *some technical limitations* have conducted teams to develop novel technology to respond more closely to the surgeons' expectations like *configuration to the anatomy of the patient and maneuver in narrow spaces* (Rivera Serrano 2012) and other advantages that will be developed during the *μRALP project*.

Rivera-Serrano CM; Johnson P, Zubiato B; & al. A Transoral Highly Flexible Robot: Novel Technology and Application Laryngoscope, 122:1067–1071, 2012



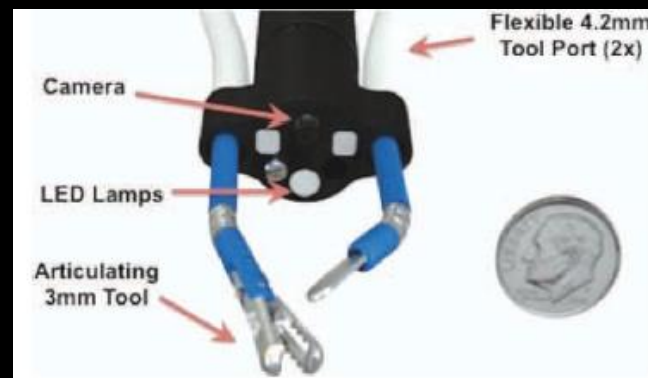
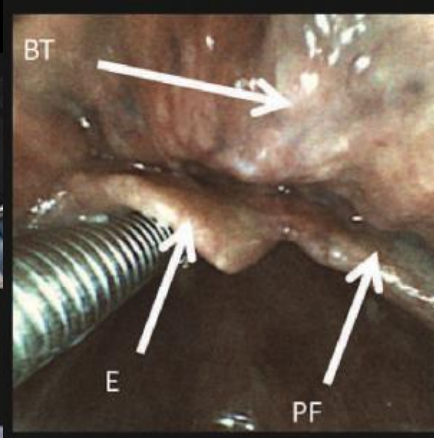
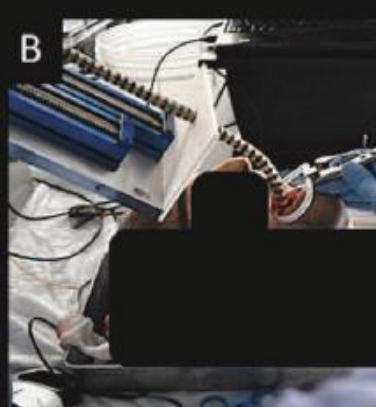
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Conclusions 2/2



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