ABSTRACT

Tongue base hypertrophy is an obstructive condition in many, if not most of, cases of obstructive sleep apnea–hypopnea syndrome (OSAHS). Base of tongue (BOT) is difficult to manage surgically, and its surgery remains a great challenge for both surgeon and patient. Although minimally invasive techniques are not sufficient to satisfactorily manage these kinds of patients, Transoral robotic surgery (TORS) has proved to provide excellent and safe access to BOT and supraglottis while enabling the surgeon to maintain haemostasis. In this study, TORS was found to achieve the best outcomes if compared versus other surgical options for management of BOT hypertrophy in OSAHS patients. These options include:

- Chabolle’s operation (open transcervical Tongue Base Reduction and Hyo-epiglottoplasty “TBRHE”)
- Maxillomandibular advancement “MMA”
- Genioglossus advancement “GGA”
- Hyoid suspension “HS” operation (Thyrohyoidopexy)

TORS was also compared versus other transoral BOT approaches (LASER and Coblation) and versus non-surgical measures e.g. CPAP and oral appliances, however, in another separate prospective study.

INTRODUCTION

Head and neck procedures have been associated with a large amount of surgical dissection with associated large surgical incisions. This can result in major tissue damage, functional impairment, and a decreased quality of life. However, with minimally invasive approaches, the improved video imaging, endoscopic technology, and instrumentation have provided the surgeon with multiple endoscopic access points. While the advance of endoscopic technology that increased surgeon capabilities, the technique still has several challenges associated with it; limited range and degree of motion of instrumentation, operative field limited to “line of sight”, lack of three-dimensional imaging of the operative field, amplification of physiologic tremors, compromised dexterity and mismatched hand-eye coordination.

With these challenges in mind, the development of surgical robotics was rooted in the desire to overcome the limitations of current endoscopic technologies and to expand the benefits of minimally invasive surgery. Transoral robotic surgery (TORS) performed with Intuitive da Vinci® has proved a feasible and tolerable option for oropharyngeal and laryngeal pathologies. Resection of the tongue base for oncological purposes has been already reported. In September 2014, TORS was clearly FDA approved for use in OSAHS surgeries. The robotic technique has been demonstrated to increase surgical precision, and it allows a more delicate handling of tissues.

METHODS AND MATERIALS

TORS was compared retrospectively versus other conventional old techniques that were used to manage tongue base obstruction in moderate to severe OSAHS patients before introduction of TORS in G.B.Morgagni L.Pierantoni hospital, Forli, Italy. These techniques include:

- Chabolle’s operation (open transcervical Tongue Base Reduction Hyo-epiglottoplasty “TBRHE”).
- Maxillomandibular advancement (MMA).
- Genioglossus advancement (GGA) ± Hyoid suspension operation(s).

RESULTS

TORS versus MMA and Chabolle’s operation:

Three matched groups of tongue base surgery (one of them was TORS) were sorted according to the primary selection criteria of statistically comparable preoperative AHI (60.33 ± 14.37 for Chabolle group, 57.76 ± 14.65 for MMA group and 57.07 ± 18.40 for TORS group).

The 3 groups were also reasonably matched for sex, age, body mass index (BMI), and palate surgery (UPPP) if done. Postoperative AHI registered (after at least 6 months) was of 21.67 ± 19.38 for Chabolle group, 8.16 ± 6.98 for MMA group and 14.21 ± 10.46 for TORS group.

The difference in postoperative AHI was statistically significant between Chabolle and MMA groups (p=0.003), and between TORS and MMA groups (p=0.02); in favor of MMA. However, that difference was not statistically significant between TORS and Chabolle groups (p=0.14).

In comparison of overall cost (from admission to discharge), Chabolle’s operation costs about 5494.98€, MMA operation costs about 10702.08€ (included cost of titanium plates and screws used in fixation), while TORS costs 5572.78 €.

TORS versus Genioglossus advancement (GGA) ± hyoid suspension (HS) operation:

Another three matched groups of tongue base surgery (one of them was TORS) were sorted according to the primary selection criteria of statistically comparable preoperative AHI (45.2 ± 27.8 for GGA±HS group, 48.5 ± 15.7 for HS group and 51.4 ± 17.60 for TORS group).

The 3 groups were also reasonably matched for sex, age, BMI, and palate surgery (UPPP). Postoperative AHI registered (after at least 6 months) was of 28.28 ± 23.72 for GGA±HS group, 21.04 ± 16.55 for HS group and 14.21 ± 10.46 for TORS group.

The difference in postoperative AHI was statistically significant between TORS versus either GGA±HS (p=0.008) or HS groups (p=0.04); in favor of TORS.

DISCUSSION

TORS versus Chabolle’s operation:

TORS can achieve the same effect as Chabolle’s operation with significantly less operative time (182.5 ± 51.72 minutes for Chabolle and 150.35 ± 36.59 minutes for TORS), less invasiveness (no cervical incision), less postoperative hospital stay (19.92 ± 8.19 days for Chabolle and 7.68 ± 1.91 days for TORS), earlier start of oral feeding (11.83 ± 7.94 days for Chabolle and 1.13 ± 0.34 days for TORS) All these statistically significant differences explain the statistically insignificant difference in the total cost (5494.98 € for Chabolle and 5572.78 € for TORS). (P>0.05)

TORS versus MMA:

In comparison of TORS versus MMA groups, TORS was found to be BMI sensitive procedure:

- If BMI > 30; AHI was reduced from 60.52 ± 11.67 for MMA and 58.6 ± 13.22 for TORS to 7.94 ± 6.68 for MMA and 18.74 ± 13.12 for TORS. The postoperative AHI is statistically significantly different in favor of MMA (as previously stated).
- If BMI< 30; AHI was reduced from 51.87 ± 19.16 for MMA and 48.32 ± 14.09 for TORS to 8.63 ± 8.05 for MMA and 12.34 ± 10.29 for TORS. The postoperative AHI is NOT statistically significantly different between 2 groups.

CONCLUSIONS

1. TORS achieve the same effect as the original Chabolle’s operation with less operative time, less invasiveness, less postoperative hospital stay, earlier start of oral feeding and with the same total cost.

2. MMA is the best single operation to treat severe OSAHS in obese patients, But; there was significant difference in operative time, morbidity, and cost.

3. TORS is BMI sensitive; If BMI > 30, MMA is preferred over TORS in AHI reduction. But if BMI < 30, there is no significant difference in AHI reduction between TORS and MMA.

4. GGA±HS operation was proved to be inferior to TORS in terms of subjective and objective functional outcomes. Even more, HS operation alone achieved the same result as GGA±HS with less invasiveness.

REFERENCES