DaVinci Robotic System™ for Treatment of Sleep Apnea Syndrome

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ABSTRACT

Objective
Tongue base hypertrophy is frequently related with the Sleep Apnea-hypopnea Syndrome (OSAHS).
Objective 1: To determinate which patients are candidates for tongue base resection by means of Trans Oral Robotic Surgery (TORS).
Objective 2: To evaluate the clinical results of this technique associated or not with other treatments.
Methods
All patients were diagnosed of OSAHS with obstructing tongue base through polisomnography, office Endoscopy and Drug Induce Sleep Endoscopy (DISE).
Ten patients with OSAHS and obstructive tongue base were surgically treated with TORS using the Intuitive Da Vinci® system and traditional surgical techniques for OSAHS between August 2011 and March 2012.
Results
The mean preoperative apnea-hyponea index (IAH) was 37,9(22,26-78,21). Patients did not required tracheotomy, no major complications were observed during or after surgery. Tongue base and epiglottis were managed securely, no problems with hemostasis were observed. Swallowing pain was present a mean of 10 days after surgery with satisfactory response to therapy with corticoesteroids and nonsteroidal anti-inflammatory drugs. One of the patients presented an epidermoid tumor in the right side of the tongue base causing the obstructive syndrome, it was resected with no affected margins using the TORS technique.

Conclusion
The DISE technique is a very specific test to determinate which patients are candidates for tongue base surgery. Most patients archived a significant improvement of their IAH and Epworth Sleepiness Scale (ESS). Traditionally, tongue base surgery has been difficult and risky, the Intuitive Da vinci® system provides excellent visualization and tissue management with low morbidity.

The authors declare no conflict of interest.

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INTRODUCTION

Obstructive sleep apnea hypopnea syndrome (OSAHS) is considered an important social problem due to the way it affects the quality of life of patients that suffer from it. There are a complete variety of signs and symptoms that include sleepiness that intervenes in patients daily activities and social life and is also an independent risk factor for stroke, high blood pressure, myocardial infarction[1,2] among other serious diseases.

Tongue base and hypopharyngeal obstruction are an important area that may compromise airway, and surgery in this area has been extremely difficult to deal with in the past due to the complexity of the surgical maneuvering in the airway[3]. Recently Vicini et al[4], and Friedman et al[5] have described their results with the use of Transoral Robotic Surgery (TORS) with the Da Vinci Robot for tongue base achieving excellent results.

We describe our own experience with this innovative technique, and provide our insight of the feasibility of the procedure.

METHODS AND MATERIALS

Eleven patients with moderate to severe OSAHS with severe hypertrophy of the tongue base were treated by TORS at the University Clinic of Navarra between August 2011 and March 2012.

Inclusion criteria: *Significant symptoms of snoring and or daytime sleepiness, Moderate to severe OSAHS confirmed by a formal Polysomnography (defined as an AHI≥15), Preoperative and Postoperative follow-up, Awake and Drug induced sleep endoscopy that suggested an obstruction of the tongue base or epiglottis, Documented intolerance of CPAP or BiPAP or refusal to use it, Adults age ≥18, Informed consent of the procedure*

Exclusion criteria: *Failure to attend postoperative follow-up, History of malignancy or infection*

No tracheotomy was performed in any of the patients operated. Instead all patients were admitted for the first 24 hours in the Intensive Care Unit (ICU) for observation.

In all patients but in one had other surgical procedures for OSAHS performed at the same time as UPPP (palatal flap), septoplasty, radiofrequency turbinate reduction, tonsillectomy or functional endoscopic sinus surgery (FESS).

In all patients we performed a complete Clinical history, awake and sleep endoscopy evaluation, CT imaging, pre and post operative polysomnography , Epworth Sleepiness Scale (ESS) and a visual analog satisfaction scale.

Operative setting for the Da Vinci Robot was the same previously described by O'Malley et al[6] for tongue base neoplasms, and tongue resection is performed in a piecemeal resection starting from the medial to the lateral aspect on each side of the base of the tongue. Trying always to identify vessels. Surgical field was left to heal by secondary scaring.

RESULTS

Eleven patients are included in the study. Only one patient had previously undergone surgery for sleep apnea. A UPPP, tonsillectomy, genioglosal advancement procedure and septoplasty had been performed.

All patients completed surgery successfully without any complications, without any need to shift to open procedures.

In postoperative period no serious complications were observed. Only one patient presented in the 3 day a minor bleeding at the base of the tongue that did not require intervention. No revision surgery was necessary in any case. All patients complained of odynophagia from between the second and 14th day with a slight peak between the 4th and 6th day. All patients but two had a tonsillectomy performed in the same procedure. No patients complained of aspiration.

Regarding operative Mean surgical time of the Robotic procedure was 32,3 ±15.2 SD minutes and mean set up time was 31,3±21,6 SD minutes.

Table 1 describes our results in the eleven patients.

All patients but one were satisfied with the procedures. Three patients had a worsening of the AHI index in the Postoperative period, but with an improvement of Mean Min O2 saturation, duration of apneas and hypopneas, ESS and satisfaction rating as they were all able to tolerate the CPAP every night after the surgical procedure with an important

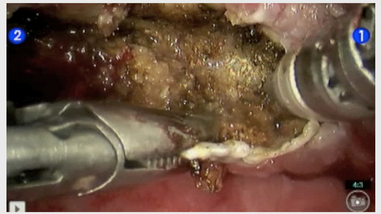

Figure 1: Tongue base and tonsil resection with DaVInci Robot

Figure 2: 6 months Post operative view, partial resetion of epiglottis and tongue base were performed

Discussion

Obstruction of the airway occurs at different levels of the pharynx in OSAHS. CPAP continues to be the standard therapy for patients. But there are a group of patients that do not tolerate or refuse to use. Severe tongue base hypertrophy or floppy epiglottis may be the main characteristic of this type of population.

The severity and area of obstruction differs between patients and therefore surgical treatment has to be tailored for each patient

Ample surgical resection of tongue base or OSAHS has been a difficult and challenging task in the past, and may be accompanied by a series of cumbersome and severe complications in the area.

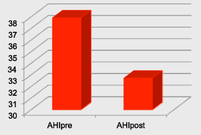

Fig 3: Mean Pre and Pos AHI

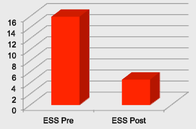

Fig 4:Mean Pre and Pos EES

	Age	BMI	AHI pre	AHI pos	O2SAT mipre	O2SAT mipos	O2SAT mepre	O2SAT mepos	Tol CPAP pre	Tol CPAP pos	ESS Pre	ESS Pos	Surgery
1	38	29,65	22,26	36	81	83	94	96	No	Yes	19	8	UPPP,TC, Septo
2	52	27,79	23,64	25,61	81	83	93	96	Yes	Yes	12	7	UPPP
3	65	26,39	33,2	24,27	90	86	92	94	No	Yes	15	4	T,UPPP,TC, Septo
4	21	29,73	78,51	91,93	84	87	96	96	No	Yes	20	5	
5	48	33,61	56,8	14,3	80	92	96	96	No	Doesn't use	15	0	T,UPPP,TC, Septo
6	52	36,85	22,26	17,5	83	91	92	96	No	Yes	14	2	T,UPPP,TC, Septo, FESS
7	63	29,6	42,16	30,45	85	81	94	93	no	Yes	17	10	T, UPPP
8	53	25,6	34	27	80	94	87	97	No	Doesn't use	12	5	T,UPPP,TC, Open Rhinosepto
9	63	24,1	53,2	72,84	79	91	87	96	Yes	Yes	18	7	T,UPPP,TC, Septo
10	32	23,87	28	8	91	95	93	96	No	Doesn't use	15	0	T,UPPP,TC, Septo
11	49	27,39	22,89	12	85	93	90	96	No	Doesn't use	18	2	T,UPPP,TC, Septo
Mean	43	28,59	37,9	32,71	83,54	88,7	92,1	95,6			15,9	4,54	

Table 1: Patients demographics.

BMI: *Body Mass Index,* ***AHIpre:*** *Apnea Hypopnea Index Preoperatory,* ***AHIpos****: Apnea Hypopnea Index Postoperatory,* ***O2SATmipre:*** *Minimun O2 Saturation Preoperatory,* ***O2SATmepre:*** *Mean O2 Saturation Preoperatory* ***O2SATmiPOST****: Minimun O2 Saturation Postoperatory ,* ***O2SATmePOST:*** *Mean O2 Satuaration Postoperatory,* ***TolCPAPpre:*** *Tolerance of CPAP preoperatory,* ***TolCPAPpos:*** *Tolerance of CPAP postperatory,* ***ESS Pre:*** *Epworth Sleepiness Scale Preperatory,* ***ESS Pos:*** *Epworth Sleepiness Scale Postoperatory*

DISCUSSION

TORS surgery offers an important advantage through multiplanar resection, tridimensional enhanced view and orientation of the surgical field.

We describe our own experience with this novel procedure in eleven patients with OSAHS, Results were very favorable especially if we take into account patients satisfaction, ESS and AHI index, median Oxygen saturation rate. (Table 1, Fig. 3,4)

In our series three patients had a worsening of the AHI, although an important improvement of ESS and Mean O2 saturation. They were hesitant about using the CPAP, but we insisted on its use and were surprised to be able to tolerate CPAP therapy with great satisfaction in the postoperative period

We believe that Drug Induced Sleep Endoscopy[7] is an extremely useful tool in assessment of diagnosis in patients that have obstruction of tongue base and epiglottis in OSAHS.

Surgical resection with the DaVinci Robot became easier, more secure, less time consuming, with a lower set up time as we gained more experience. And also a larger resection of tongue base was performed as experience was achieved. We need to point out that other sleep surgical procedures were performed in a safe in combination with the tongue base robotic surgery.

CONCLUSIONS

Resection of tongue base for OSAHS can be safely performed with excellent results. Postoperatory result have shown an improvement in all patients of the AHI, mean lowest O2 saturation and mean Oxigen saturation with a reduction of ESS.

Surgical resection of the tongue base with Robotic DaVinci Surgery seems to be an extremely promising method to improve life quality of patients with sleep apnea.

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