Robot-Assisted Microsurgery in Head & Neck Reconstruction: Early Experience at a Single Institution

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INTRODUCTION

- Robot-Assisted Microsurgery (RAMS) aims to increase the precision and feasibility of microvascular surgery through the use of microsurgical robotic systems.
- Data on the use of RAMS in head & neck microvascular reconstruction is limited.
- Potential benefits of RAMS include decreased surgeon tremor and the ability to perform successful microvascular surgery on vessels with smaller diameters.

METHODS

- Prospective descriptive study.
- All head & neck microvascular reconstructions in which RAMS was employed were included.
- The microsurgical robotic system used was the Symani System.
- An exoscope was used for magnification.
- All surgeries were performed by an experienced microvascular surgeon who had completed the requisite RAMS training and certification.
- Arterial anastomoses were performed through RAMS.
- Venous anastomoses were completed manually using coupler devices.
- Recorded metrics were arterial anastomosis time, ischemia time, arterial anastomosis success rate, anastomosis revision rate, and flap survival rate.

Fig. 1: Symani Surgical System used during RAMS.

RESULTS

Table 1: Robotic-Assisted Microvascular Reconstruction Cases

Case	Anastomosis Time (*Minutes*)	Ischemia Time (*Minutes*)	Revision	Flap Success
1	49	128	No	Yes
2	46	124	No	Yes
3	44	112	No	Yes
4	43	116	No	Yes
5	35	96	No	Yes
6	36	92	No	Yes
7	41	128	Yes	No
8	37	94	No	Yes
9	40	104	No	Yes
10	38	84	No	Yes
11	39	88	No	Yes
12	21	72	No	Yes
13	27	76	No	Yes
14	24	68	No	Yes
15	42	80	No	Yes
16	22	120	Yes	Yes
17	26	100	No	Yes
18	25	108	No	Yes
19	19	62	No	Yes
20	28	90	No	Yes
21	29	98	No	Yes
22	20	66	No	Yes
23	18	60	No	Yes
24	23	64	No	Yes

Fig. 2: Surgeon's view while performing RAMS.

RESULTS SUMMARY

- 24 head & neck reconstructive surgeries were completed using RAMS.
- 24 end-to-end arterial anastomoses were performed.
- The average time for arterial anastomosis completion was 32 minutes.
- The average ischemia time was 94 minutes.
- 22/24 arterial anastomoses were successful.
  - 2/24 arterial anastomoses required manual revision.
- 1/24 flap experienced postoperative total failure and required replacement with a pedicled flap.
- Subjectively, there was reduction in surgeon tremor across all cases.

PRELIMINARY CONCLUSIONS

- Successful end-to-end arterial anastomoses can be achieved using the Symani System microsurgical robotic system in head & neck microvascular reconstruction.
- Prolonged arterial anastomosis and ischemia times, and elevated flap and anastomosis failure rates early in the study suggest there is a significant learning curve associated with RAMS.
- After overcoming a learning curve, arterial anastomoses with RAMS proved to be comparable to traditional anastomoses in anastomosis and ischemia times and flap success rate.
- Reduction in surgeon tremor proved to be the most evident benefit of RAMS.
- Further studies and increased familiarity with the Symani System are needed to clarify RAMS's role in head & neck microvascular reconstruction.

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