Endoscopic Endonasal Skull Base Surgery in Pediatric Patients and Impact on Midface Growth

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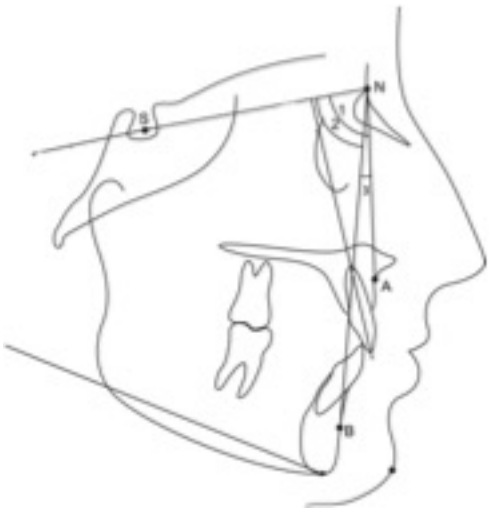
Introduction

Cranial base development plays a large role in maxillary growth, including vertical and anterior dimensions, until approximately age 7. The effect of early cranial base surgery on subsequent midface growth is unknown. Cephalometrics is a well-established methodology in the oromaxillofacial discipline to analyze the craniofacial skeleton. Our goal is to determine whether early endoscopic endonasal skull base surgery has any effect on midface development.

Methods

This was a retrospective review (2000-2016) comparing patients who underwent endoscopic endonasal skull base surgery before and after age seven. Patients with imaging >1yr post-op were included. Measurements were performed by our radiology team and compared to published norms. Z-score was used to describe the number of deviation away from the norm/control. Significance was set at $p<0.05$.

Figure 1. Cephalometric measurements.



S = Sella, N = Nasion, A = A point, most concave aspect of maxilla; B = B point, most concave aspect of mandible. These points and composite angles describe the position of the maxilla and mandible within the craniofacial skeleton, and with each other.

Results

- Comparing the <7yo group to Bolton standard norms, no significant difference in post-operative SNA (p=0.10), SNB (p=0.14), or ANB (p=0.67). SN distance was reduced both pre- and post-operatively (SD=1.5, p=0.01 and p=0.009).
- Tumor type (craniopharyngioma vs. angiofibroma vs. all other types) had no significant effect in either age group (p>0.05).
- Sex had no significant effect.

Table 1. Demographic Information.

	<7yo Group	≧7yo Group
Ave age at surgery	5.6yo	14.7yo
Sex	Males, n=7 Female, n=4	Males, n=25 Females, n=12
Ave f/u duration	5.3 years	5.2 years
Tumor Types	55% Craniopharyngiomas 18% Chordomas 9% Dermoids	24% Fibromas 22% Craniopharyngiomas 22% Pituitary Adenomas

Table 2. Effect of Patient Sex.

Effect of Sex			Z-score			Significance
Subjects			N =	Mean	SD	Median	p-value
Male	*Pre-op*	SN	6	-1.29	1.52	-1.09	0.092
		SNA	6	-0.55	1.63	-0.23	0.447
		SNB	6	-1.63	1.78	-0.86	0.074
		ANB	6	1.50	1.80	0.85	0.097
	Post-op	SN	6	-1.31	1.70	-0.96	0.118
		SNA	6	-0.04	0.83	0.12	0.901
		SNB	6	-0.07	1.13	-0.19	0.886
		ANB	6	0.15	2.67	-0.69	0.895
Female	*Pre-op*	SN	4	-1.84	1.66	-2.18	0.114
		SNA	4	-1.17	1.62	-1.39	0.246
		SNB	3	-3.11	0.56	-3.35	*0.011
		ANB	4	1.99	1.95	1.71	0.134
	Post-op	SN	4	-2.09	1.38	-1.99	0.057
		SNA	4	-2.06	1.36	-2.32	0.057
		SNB	4	-2.76	2.63	-2.60	0.126
		ANB	3	0.84	2.84	-0.41	0.660

Table 3. Comparison of Early Surgery Group to Published Control Values.

<7 Surgery Group vs Controls		Z-Score			Significance
		N =	Mean	SD	Median	p-value
Pre-op	SN	10	-1.51	1.51	-1.28	*0.012
	SNA	10	-0.80	1.57	-0.63	0.143
	SNB	9	-2.13	1.61	-1.90	*0.004
	ANB	10	1.69	1.77	1.35	*0.014
Post-op	SN	10	-1.62	1.55	-1.17	*0.009
	SNA	10	-0.85	1.44	-0.15	0.095
	SNB	10	-1.15	2.22	-0.48	0.137
	ANB	9	0.38	2.57	-0.41	0.669
Change	SN	10	-0.11	1.93	-0.05	0.862
	SNA	10	-0.05	1.15	0.06	0.887
	SNB	9	1.51	1.55	1.64	*0.019
	ANB	9	-1.51	2.74	-1.99	0.137

Table 4. Comparison of Early and Late Surgery Groups.

Comparing Age Groups		Age >=7				Age <7				
			Z-score				Z-score			
		N =	Mean	SD	Median	N =	Mean	SD	Median	p-value
Pre-op	**SN**	22	-1.66	1.35	-1.62	10	-1.51	1.51	-1.28	0.782
	SNA	22	0.04	1.67	0.12	10	-0.80	1.57	-0.63	0.189
	SNB	22	-0.23	1.67	-0.28	9	-2.13	1.61	-1.90	*0.007
	ANB	22	0.38	1.60	0.65	10	1.69	1.77	1.35	*0.045
Post-op	**SN**	21	-1.36	1.43	-1.75	10	-1.62	1.55	-1.17	0.651
	SNA	21	-0.41	2.03	-0.38	10	-0.85	1.44	-0.15	0.544
	SNB	21	0.58	3.91	0.00	10	-1.15	2.22	-0.48	0.208
	ANB	21	-0.49	1.88	-0.44	9	0.38	2.57	-0.41	0.305

Conclusions

The early surgery group exhibited some abnormal pre-op measurements, but cephalometric analysis of long-term follow-up imaging revealed morphology falling within normal standard deviations. In our cohort, early endoscopic endonasal skull base surgery does not impact craniofacial development.

References

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