# Factors Influencing Amount of Head Shape Deformity Correction in the Treatment of Positional Plagiocephaly

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Introduction

With the Back to Sleep campaign, the incidence of sudden infant death syndrome decreased while the prevalence of positional skull deformation increased dramatically. We aimed to review our institutional experience (2008-2014) in treatment of positional plagiocephaly to explore factors associated with measured improvement while in treatment.

Laser Surface Measurement
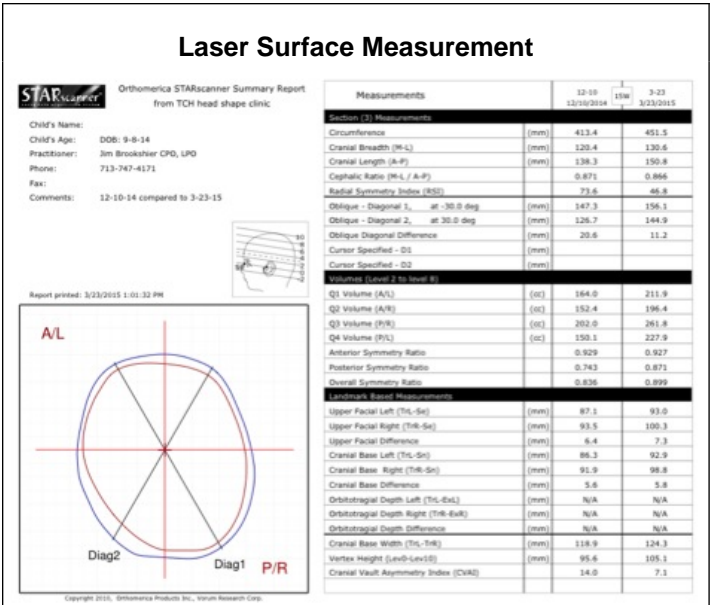
Study Cohort

- **1299** • Total screened in head shape clinic
- **1048** • Included diagnoses Occipital Brachycephaly, Occipital Plagiocephaly, and patients with both diagnosis
  • Excluded 245 patients with other diagnoses and 6 patients age patient age > 11 months at present
- **991** • Patients with recommended treatment plan: HM, RP/PT, RP/PT/HM
  • Excluded 61 patients without documented treatment plan
- **884** • Patients received treatment: HM, RP/PT, RP/PT/HM
  • 107 patients did not return for follow up after initial appointment.
- **552** • Patients completed treatment, with pre- and post-treatment STAR scans.

Methods

A retrospective chart review was conducted, with risk factors and treatment for positional head shape deformity recorded. Univariate and multivariate analysis was used to assess the impact of these variables on the change in measured oblique diagonal difference (ODD) on head surface scanning pre- and post-treatment.

Head Shape Measurement Before and After

Treatment Received	First ODD	Last ODD	Reduction in ODD	Reduction in ODD		First CR	Last CR	Reduction in CR	Reduction in CR (%)
	Number of cases	Mean (SD)	Mean (SD)	(mm)	(%)	Number of cases	Mean (SD)	Mean (SD)	
Diagnosis 379		Occipital Plagiocephaly				87	Occipital Brachycephaly			
HM	122	15.3 (3.4)	9.5 (2.9)	5.8	36.7	50	0.975 (0.062)	0.930 (0.054)	0.045	4.6
RP/PT/HM	120	13.9 (3.5)	9.1 (3.2)	4.8	33.5	9	1.000 (0.054)	0.942 (0.041)	0.058	5.7
RP/PT	137	10.9 (3.2)	9.2 (3.4)	1.7	15.1	28	0.973 (0.041)	0.955 (0.034)	0.019	1.9
Diagnosis 86		Occipital Brachycephaly and Occipital Plagiocephaly								
HM	41	11.9 (4.1)	7.3 (3.0)	4.5	37.0		0.977 (0.035)	0.932 (0.038)	0.044	4.5
RP/PT/HM	21	10.0 (3.6)	6.3 (3.0)	3.8	35.9		0.973 (0.031)	0.918 (0.031)	0.055	5.6
RP/PT	24	9.5 (2.9)	7.9 (2.6)	1.6	15.6		0.957 (0.030)	0.938 (0.030)	0.019	2.0

Factors Associated with Head Shape Improvement

Measurement : Oblique Diagonal Difference	Coefficient (Reference = 0)	Lower 95% CI	Upper 95% CI	P-Value (N = 465)
Received Treatment				
RP/PT(Refence) vs HM	4.235	3.602	4.868	<0.001
RP/PT vs RP/PT/HM	3.158	2.539	3.778	<0.001
Corrected Age at present				
0-4 Months vs > 4-6 Months	-1.791	-2.386	-1.196	<0.001
0-4 Months vs 7-11 Months	-2.642	-3.362	-1.922	<0.001

Measurement : Cephalic Ratios	Coefficient (Reference = 0)	Lower 95% CI	Upper 95% CI	P-Value (N = 173)
Received Treatment				
RP/PT vs HM	0.266	0.019	0.034	<0.001
RP/PT vs RP/PT/HM	0.036	0.026	0.046	<0.001
Corrected Age at present				
0-4 Months vs > 4-6 Months	0.006	-0.003	0.014	0.209
0-4 Months vs 7-11 Months	-0.006	-0.016	0.004	0.230

Abbreviation: HM:Helmet; RP: Reposition; PT: Physical Therapy; ODD: Oblique Diagonal Difference; CR: Cephalic Ratio; SD: Standard Deviation; CI: Confidence Interval

Results

991 patients presented at age <12 months with occipital brachycephaly (18.4%), occipital plagiocephaly(69.5%), or both (12.1%). Recommended treatment included repositioning(RP), physical therapy(PT), or helmet(HM) according to our age- and risk factor-dependent algorithm. 552 patients had pre- and post-treatment surface scanner evaluations. Average presenting age was 6.2 months (corrected for prematurity for treatment considerations). 543 patients had RP or PT as first recommended treatment. 137 patients transitioned to HM. The remainder had failed RP/PT prior to presentation and the starting treatment recommendation was HM. The % improvement in ODD were 36.7%, 33.5%, and 15.1% for patients receiving HM, RP/PT, and RP/PT/HM, respectively. Univariate analysis showed gender, race, insurance, diagnosis, sleep position preference, torticollis history, and multiple gestation were not significantly associated with magnitude of ODD change during treatment. On multivariate analysis, corrected age at presentation and type of treatment received were significantly associated with magnitude of ODD change. Helmet therapy corresponded with the largest ODD change, while the RP/PT group had the least. Earlier age at presentation corresponded with larger ODD change.

Learning Objectives

By the conclusion of this session, participants should be able to:
(1) describe variables included in management decisions of infant positional skull deformity
(2) name factors associated with larger measured changes in oblique diagonal difference during head shape deformity treatment

Conclusions

Earlier age at presentation and type of treatment impact the degree of measured deformational head shape correction in positional plagiocephaly.