Introduction:

Ever since the introduction of mandible distraction in hemifacial microsomia by McCarthy in 1992, it has gained popularity because of the hypothesized concurrent soft tissue expansion, which is believed to reduce postoperative relapse. Although many articles describe the immediate success of mandibular distraction, revealing relapse cases in long term postoperative follow up has become a serious problem. The aims of this study were to examine long-term craniofacial changes after distraction and to identify factors influencing the relapse, and to suggest adequate amount of distraction in surgical treatment protocol.

Methods:

Twenty five hemifacial microsomia patients treated with unilateral mandibular distraction were recalled. The mean follow up was 36.9 (±15.2) month and average age was 9.24 (±2.6) year old. Changes in the ratio of mandible ramus height and facial height were measured at the time of pre-operation, end of distraction and long-term follow-up using the posteroanterior cephalographs and panoramic X-rays. Ratios between affected and non-affected mandibular ramal heights and facial heights were measured and compared at each point.

Results:

The ratio of both mandible ramus height and facial height were improved after distraction. On average, the ratio of ramal height (condylon to antegonion) increased by 30.3%; during same period, the ratio of facial height (horizontal orbital plane to antegonion) increased by 15%. However, at long term follow up after distraction, the ratio of ramus height and facial height showed a return of the asymmetry by 16.1% and 8.2%. The relapse degree was related to the initial severity and the amount of distraction. Both in the severe group and overcorrection group were revealed apparent proportion of relapse. Although, below the severe affected group and non-overcorrection group presented a similar rate of relapse.

Conclusions:

Both mandibular and facial asymmetry is significantly improved after distraction, and despite relapse concluded during follow up, surgical correction is maintained. Compared to the ratio of facial height, the ratio of mandibular height is improved almost twice. Even though short term effect of distraction osteogenesis are well accepted, to reduce the rate of relapse, below about 30% of distraction amount was preferred than overcorrection in a single stage operation according to the severity. And the more severe discrepancy of the ramal heights at initial resulted in lager amount of relapse.

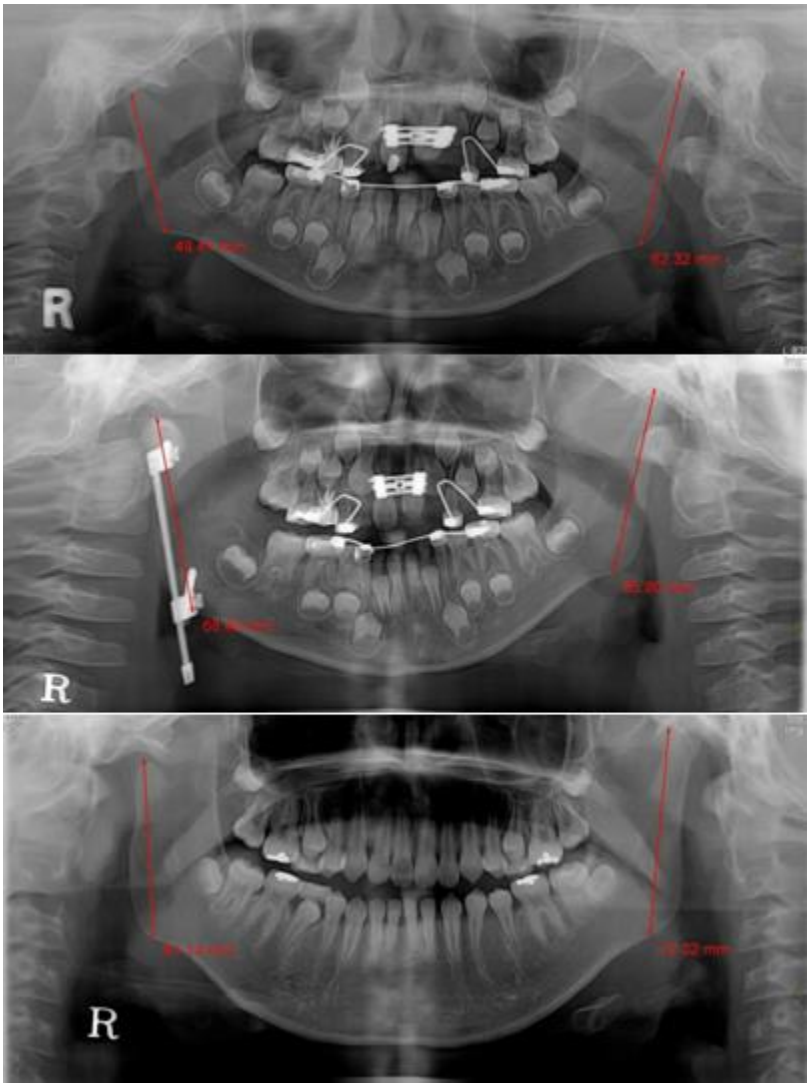

Figure 1. Measurements of the ramal height in panoramic view of right hemifacial microsomia upper: At pre-distraction, ratio between affected and non-affected ramus was estimated in 0.793 (49.41mm/62.32mm); middle: At the end of distraction, ratio was 1.041 (68.49mm/65.80mm); under: Five years after distraction, ratio was 0.849 (61.14mm/72.02mm)

Measurement																	
No.	Sex	Age	Affected side	DO duration (day)	F/U duration (month)	PreOp.		End of distraction				F/U					
						Mandible	Facial	Mandible		Facial		Mandible			Facial		
						ratio (preOp.)	ratio (preOp.)	ratio (EOD)	lengthening (%)	ratio (EOD)	lengthening (%)	ratio (F/U)	maintenance (%)	relapse (%)	ratio (F/U)	maintenance (%)	relapse (%)
1	M	5	R	32	6	0.781	0.901	0.957	22.5%	0.953	5.8%	0.877	12.3%	-8.3%	0.936	3.9%	-1.8%
2	M	5	R	24	12	0.975	0.964	1.026	5.2%	1.102	14.4%	0.988	1.4%	-3.6%	0.991	2.8%	-10.1%
3	M	10	R	42	7	0.616	0.836	0.993	61.2%	0.995	19.0%	0.571	-7.2%	-42.5%	0.956	14.4%	-3.9%
4	M	6	L	36	142	0.954	0.942	0.974	6.6%	0.994	5.4%	0.794	-13.1%	-18.5%	0.832	-11.7%	-16.3%
5	F	5	R	32	124	0.793	0.945	1.025	29.2%	1.053	11.4%	0.827	4.3%	-19.3%	0.953	0.8%	-9.5%
6	M	9	L	52	36	0.901	0.928	1.021	13.3%	1.027	10.8%	1.037	15.1%	1.6%	0.930	0.3%	-9.4%
7	M	7	R	36	37	0.852	0.906	1.082	26.9%	1.067	17.7%	1.031	21.0%	-4.7%	1.006	11.1%	-5.7%
8	M	5	R	36	32	0.776	0.903	1.093	40.9%	1.123	24.5%	0.838	8.1%	-23.3%	0.975	8.0%	-13.2%
9	M	6	L	32	86	0.815	0.868	1.112	36.4%	1.136	30.9%	0.893	9.6%	-19.7%	0.855	-1.4%	-24.7%
10	M	5	R	48	94	0.742	0.883	1.127	51.9%	1.134	28.4%	0.845	13.9%	-25.0%	0.963	9.0%	-15.1%
11	F	8	R	24	19	0.821	0.825	1.139	38.8%	1.010	22.5%	0.896	9.2%	-21.3%	0.951	15.3%	-5.8%
12	F	37	R	31	13	0.764	0.885	0.814	6.5%	0.959	8.3%	0.874	14.3%	7.3%	0.963	8.8%	0.5%
13	M	8	L	33	14	0.908	0.962	1.096	20.8%	0.996	3.6%	1.025	13.0%	-6.5%	0.950	-1.2%	-4.6%
14	M	6	R	38	62	0.793	0.893	1.041	31.3%	1.094	22.5%	0.849	7.1%	-18.4%	1.000	11.9%	-8.6%
15	F	12	R	22	30	0.913	0.952	1.052	15.2%	1.091	14.6%	0.940	2.9%	-10.7%	1.059	11.2%	-3.0%
16	F	15	L	30	2	0.919	0.897	1.088	18.4%	0.979	9.2%	1.068	16.3%	-1.8%	0.947	5.7%	-3.2%
17	M	5	L	45	52	0.611	0.843	1.177	92.7%	0.998	18.4%	0.572	-6.3%	-51.4%	0.949	12.5%	-5.0%
18	M	7	L	43	45	0.653	0.783	1.034	58.4%	1.000	27.6%	0.668	2.4%	-35.4%	0.880	12.4%	-12.0%
19	M	11	R	15	42	0.874	0.958	1.008	15.2%	1.002	4.5%	0.866	-1.0%	-14.1%	0.964	0.6%	-3.8%
20	M	10	L	37	25	0.641	0.765	0.960	49.8%	0.925	20.9%	0.670	4.6%	-30.2%	0.731	-4.5%	-21.0%
21	M	11	R	31	12	0.873	0.942	1.026	17.4%	1.023	8.6%	0.969	10.9%	-5.5%	1.017	8.0%	-0.6%
22	F	8	R	30	14	0.720	0.897	0.889	23.4%	1.028	14.6%	0.805	11.7%	-9.5%	0.939	4.7%	-8.7%
23	M	11	L	36	9	0.715	0.993	0.952	33.1%	1.071	7.9%	0.781	9.1%	-18.0%	0.977	-1.5%	-8.7%
24	M	9	L	31	4	0.860	0.961	0.954	10.9%	1.086	13.0%	0.804	-6.6%	-15.8%	0.993	3.4%	-8.5%
25	F	10	L	27	4	0.758	0.920	0.995	31.3%	1.022	11.0%	0.907	19.7%	-8.8%	0.992	7.7%	-2.9%
Mean		9.24 (±2.6)		33.72 (±13.8)	36.92 (±15.2)	0.800 (±0.33)	0.902 (±0.37)	1.025 (±0.42)	30.3%	1.035 (±0.42)	15.0%	0.856 (±0.35)	6.9%	-16.1%	0.948 (±0.39)	5.3%	-8.2%

Table 1. Values and ratios with changes of at each follow-up point. The mean follow up was 36.9 (±15.2) month and average age was 9.24 (±2.6) year old. On average, the ratio of ramal height (condylon to antegonion) increased by 30.3% and the ratio of facial height (horizontal orbital plane to antegonion) increased by 15%. After last follow-up, the ratio of ramus height and facial height showed a return of the asymmetry by 16.1% and 8.2%, repectively.

(DO: distraction osteogenesis; F/U: time of last follow-up)