Short-term and long-term stability of surgically assisted rapid palatal expansion revisited

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Introduction: The purpose of this article is to present further longitudinal data for short-term and long-term stability, following up our previous article in the surgery literature with a larger sample and 2 years of stability data. **Methods:** Data from 38 patients enrolled in this prospective study were collected before treatment, at maximum expansion, at removal of the expander 6 months later, before any second surgical phase, at the end of orthodontic treatment, and at the 2-year follow-up, by using posteroanterior cephalograms and dental casts. **Results:** With surgically assisted rapid palatal expansion (SARPE), the mean maximum expansion at the first molar was 7.60 ± 1.57 mm, and the mean relapse was 1.83 ± 1.83 mm (24%). Modest relapse after completion of treatment was not statistically significant for all teeth except for the maxillary first molar (0.99 ± 1.1 mm). A significant relationship ($P < 0.0001$) was observed between the amount of relapse after SARPE and the post-treatment observation. At maximum, a skeletal expansion of 3.58 ± 1.63 mm was obtained, and this was stable. **Conclusions:** Skeletal changes with SARPE were modest but stable. Relapse in dental expansion was almost totally attributed to lingual movement of the posterior teeth; 64% of the patients had more than 2 mm of dental changes. Phase 2 surgery did not affect dental relapse. (Am J Orthod Dentofacial Orthop 2011;139:815-22)

Although a number of articles on the stability of surgically assisted rapid palatal expansion (SARPE) have been published, the reported stability varies considerably.[1-8] It is apparent that most conclusions about the stability of SARPE depend on what was measured and when the measurements were made during the sequence of treatment. The goal of this article was to present further longitudinal data for short-term and long-term stability, following up our previous article in the surgery literature with a larger sample and 2 years of stability data.[9]

MATERIAL AND METHODS

Thirty-eight patients, 19 females and 19 males between 15 and 54 years of age, agreed to participate in a prospective, observational study of SARPE outcomes approved by the Ethics Committee of Laval University in Québec, Canada. All had dental casts and posteroanterior (PA) cephalograms immediately before SARPE (T1), at the completion of expansion (T2), and at the removal of the expander approximately 6 months later (T3). As of the end of January 2010, 32 had the same records before any second surgical phase (T4), 37 had records at the completion of orthodontic treatment (T5), and 23 had records 2 years after the end of orthodontic treatment (T6). Treatment characteristics are described in Table I.

A tooth-borne expansion device (Superscrew Superspring, Highwood, Ill), either banded (n = 21) or bonded with occlusal coverage (n = 17) was used (Fig 1).

The surgical technique (described in detail previously) included separation of the pterygoid junction and the midpalatal suture between the incisors' roots.[9] All surgery was performed by the same surgeon.

After the surgery, a latency period of 7 days was observed, and then the patients were instructed to activate the screw by 0.25 mm twice a day. The patients were monitored twice a week until the planned expansion was achieved 14 to 21 days later. Active orthodontic treatment for the maxillary dentition began 2 months after expansion had stopped. The expansion device was kept in place for approximately 6 months. In the mandibular arch, orthodontic alignment of the teeth began 1 week to 2 months before SARPE.

After the removal of the expander, no other retention except the main archwire was used until the end of orthodontic treatment. When the braces were removed,

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Table I. Treatment characteristics of the experimental sample

Observation time point	*n*	*Mean time (mo)*	*SD*	*Minimum*	*Maximum*
T1-T2 (distraction completed)	38	0.68	0.23	0.46	1.81
T2-T3 (expander retention)	38	5.95	0.68	4.21	7.13
T1-T4 (start to second surgery)	32	15.27	3.99	9.40	24.28
T2-T5 (end of expansion to deband)	37	21.59	5.28	12.88	41.69
T3-T5 (expander out to deband)	37	15.64	5.09	7.79	35.19
D1-T5 (total treatment time)	37	23.57	5.27	15.41	43.07
T5-T6 (postorthodontic treatment)	23	25.35	4.49	20.96	39.49

D1, Treatment initiated in the mandibular arch; *T(x)-T(y)*, observation between 2 time points.

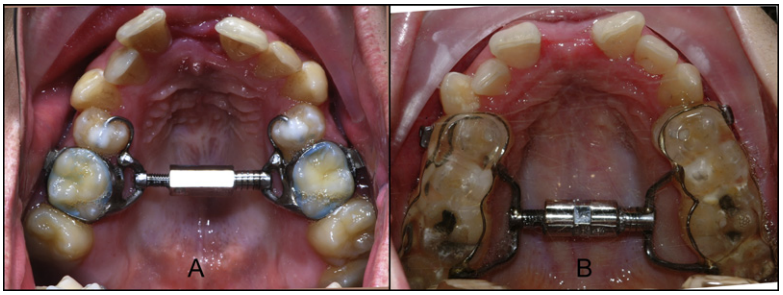

Fig 1. Superscrew for palatal expansion: **A,** with 2 molar bands and 2 bonded occlusal rests on the first premolars; **B,** with bonded occlusal coverage. The bonded version was used for patients with an open bite or a high mandibular plane angle to minimize downward-backward rotation of the mandible.

a bonded lingual wire was placed from canine to canine in both arches. No removable retainers were used.

Of the 38 patients who completed the distraction phase, 32 had a second surgical phase planned (usually superior repositioning of the maxilla or mandibular advancement), but 4 of them did not need it after reassessment. One patient was overexpanded and needed constriction of the maxilla at the second surgical phase to achieve arch coordination. His data were removed at T5. Twenty-three patients so far have returned for records 2 years after the end of orthodontic treatment.

On the PA cephalograms, posterior maxillary width was measured as the distance between the bilateral jugula points, and nasal width was measured across the lowest wide part of the nasal cavity (Fig 2). The enlargement factor was assessed by using the width of the screw in situ and compared with the width of the screw on the PA cephalogram. On the dental casts, maxillary intercanine, interpremolar, and intermolar widths were measured as the distances between the cusp tips of the canines, mesial fossae of the premolars, and central fossae of the molars. Mandibular inter-first molar width was measured in the central fossae.

The statistical significance of changes between baseline and posttreatment data was assessed by using paired 2-sample *t* tests and repeated measures analysis

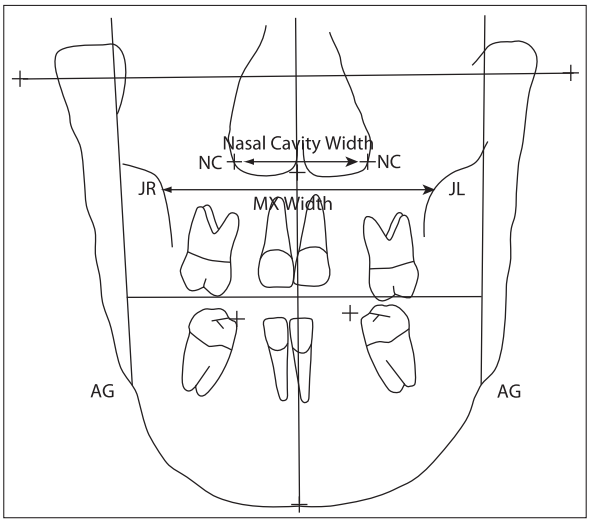

Fig 2. Width measurements on PA cephalometric radiographs used in this study. Maxillary (*MX*) width was measured between jugula left (*JL*) and right (*JR*), with jugula defined as the point on the jugal process at the intersection of the outline of maxillary tuberosity and the zygomatic process. Nasal cavity (*NC*) width was measured between the left and right points at the lowest part of the maximum concavity of the piriform rim.