Early Orthognathic Surgery in Growing Class III Patients

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The use of orthognathic surgery to correct dentofacial problems in growing patients is a controversial topic.[1] The main justification for performing orthognathic surgery in adolescents is to improve their self-esteem.[2-7] In some patients with unfavorable growth patterns, orthognathic surgery can also provide better and more stable long-term results compared with orthopedic treatment.[8-10]

Patients with Class II malocclusion who have undergone early mandibular advancement surgery have shown acceptable stability,[11-17] except in cases involving more than 10mm of mandibular advancement.[18] Correction of maxillary vertical excess with early impaction surgery tends to remain stable because the surgery affects neither the vertical growth of the maxilla nor residual mandibular growth.[19-23] To date, however, no authors have published the outcomes of orthognathic surgery in growing patients with Class III malocclusion.

In this article, we present the short- and long-term results of early orthognathic surgery in three severe Class III cases. The patients were all considered candidates for surgery because their craniofacial features were predictive of unfavorable responses to orthopedic treatment.[9] The surgeries were performed during the postpubertal phase of the adolescent growth spurt[24] and, therefore, were considered early compared to the typical timing for Class III surgery.

Case 1

A 12-year-old female in the late mixed dentition presented with a severe sagittal maxillomandibular discrepancy (maxillomandibular differential = 44mm, ANB = –7°), mandibular prognathism (SNB = 87°), excessive mandibular length (124mm), negative overjet (–11mm), and


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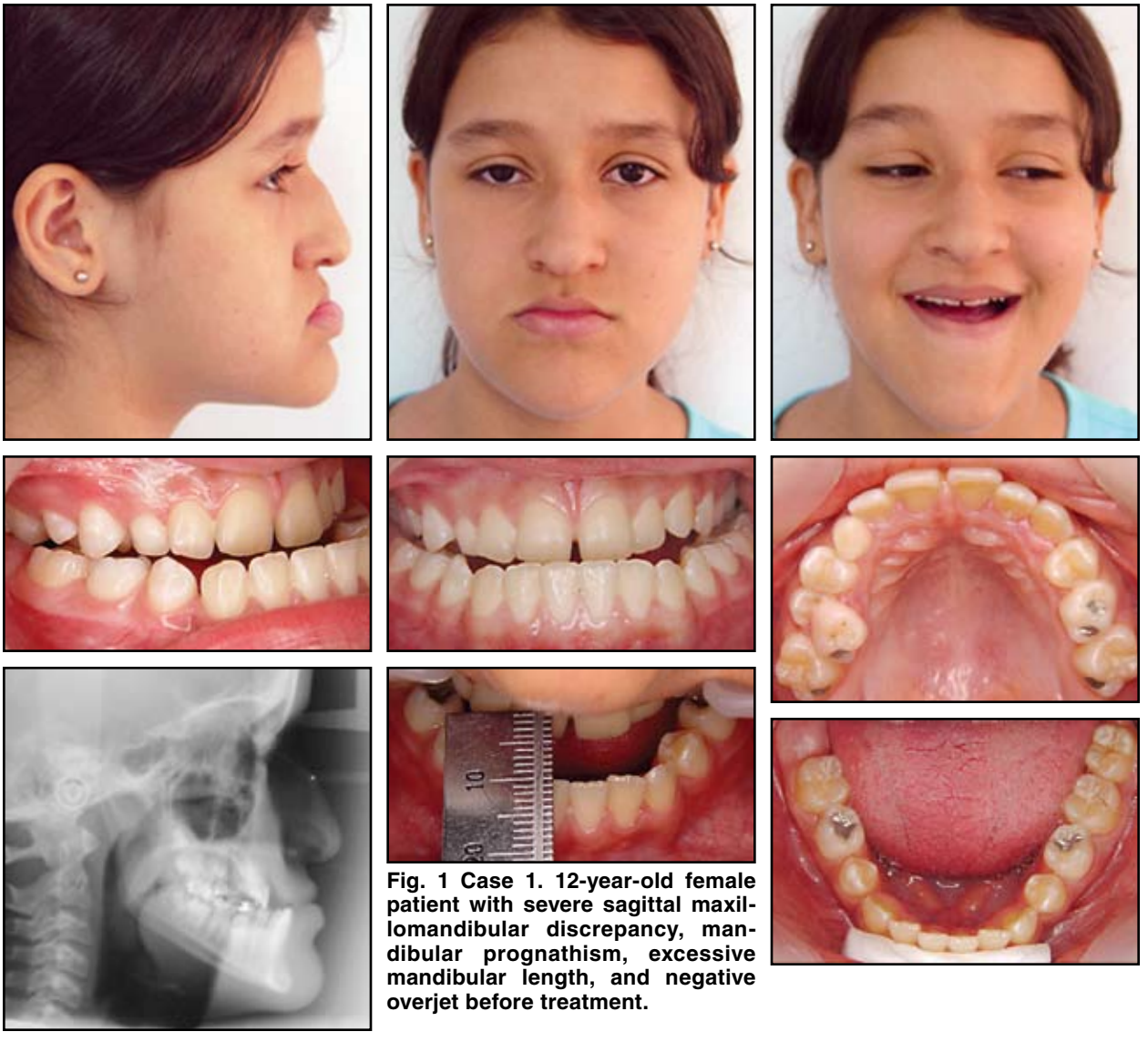

Fig. 1 Case 1. 12-year-old female patient with severe sagittal maxillomandibular discrepancy, mandibular prognathism, excessive mandibular length, and negative overjet before treatment.

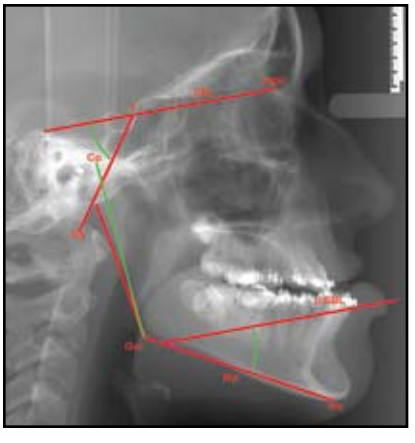

Fig. 2 Cephalometric variables for predictive analysis in Class III cases: length of mandibular ramus, Co-Goi (condylion-gonion intersection); cranial base angle, Ba-T-SBL (basion-point T-stable basicranial line); mandibular plane angle, Mp-SBL (mandibular plane-stable basicranial line). SBL is traced through point T (most superior point of anterior wall of sella turcica, at junction with tuberculum sellae) and point FMN (fronto-nasomaxillary suture). Individual score (IS) is calculated by multiplying Co-Goi by .3, Ba-T-SBL by .2, and Mp-SBL by .1 and summing products. IS below 30 indicates treatment with orthopedic approach; IS above 30 indicates surgical treatment.

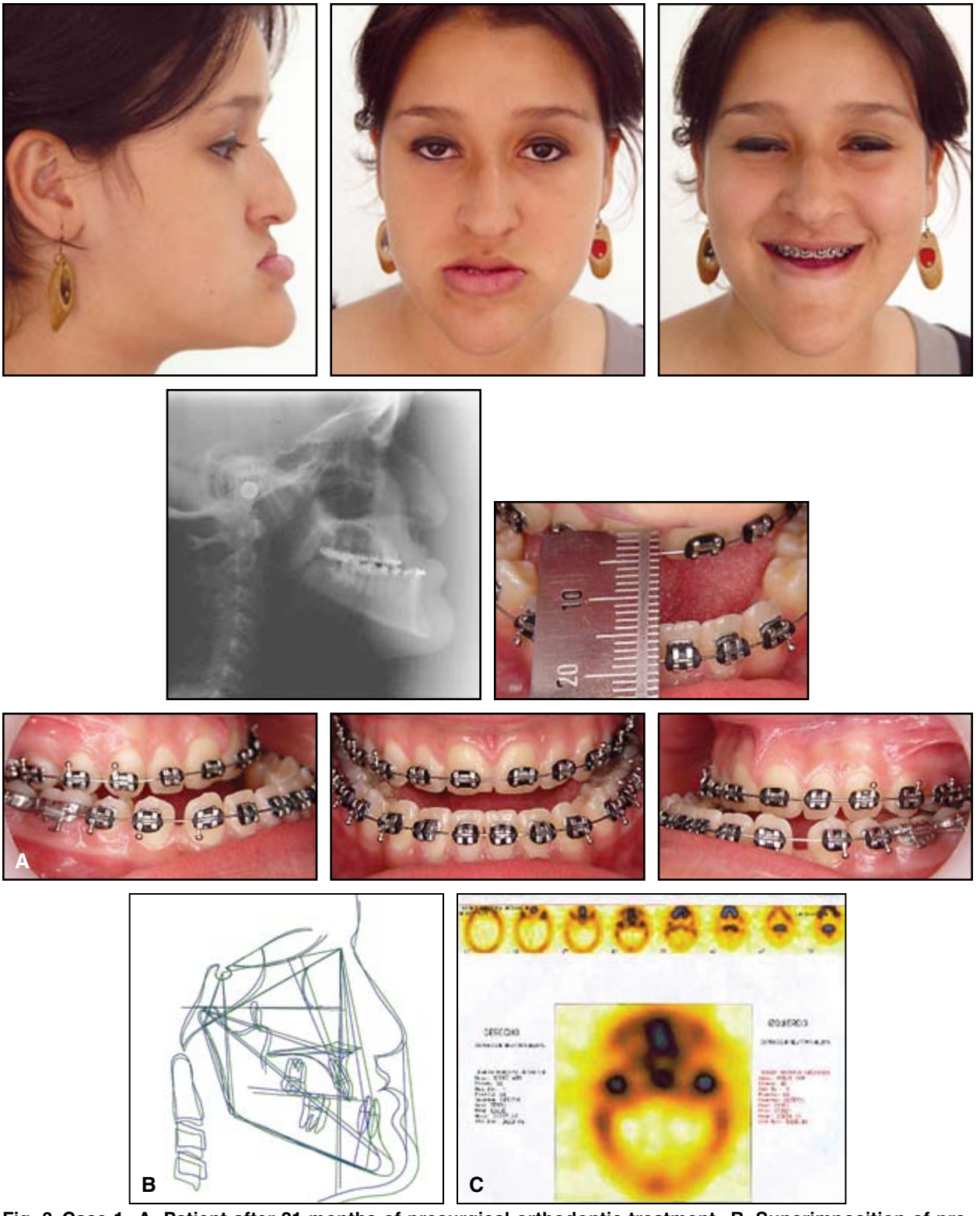

Fig. 3 Case 1. A. Patient after 21 months of presurgical orthodontic treatment. B. Superimposition of pretreatment (blue) and presurgical (green) cephalometric tracings. C. Scintigraphy reveals hypercaptation of mandibular condyles.

severe psychological stress resulting from her facial appearance (Fig. 1). Prediction analysis based on her craniofacial features (Fig. 2) determined that she was not a good candidate for an orthopedic approach, with an individual score (IS) of 31.9.[9] She was in the prepubertal (CS 3) stage of skeletal maturation.[24]

After 21 months of presurgical orthodontic treatment (Fig. 3), the patient was ready for surgery (CS 5). Scintigraphy revealed hypercaptation of both mandibular condyles, indicating bilateral condylar hyperplasia.

Orthognathic surgery consisted of a high Le Fort I osteotomy for maxillary advancement (8mm), bilateral intracapsular high condylectomy,[25] bilateral sagittal split osteotomy for mandibular retraction (7mm), and genioplasty for chin retraction (4mm). High condylectomy involves removing the

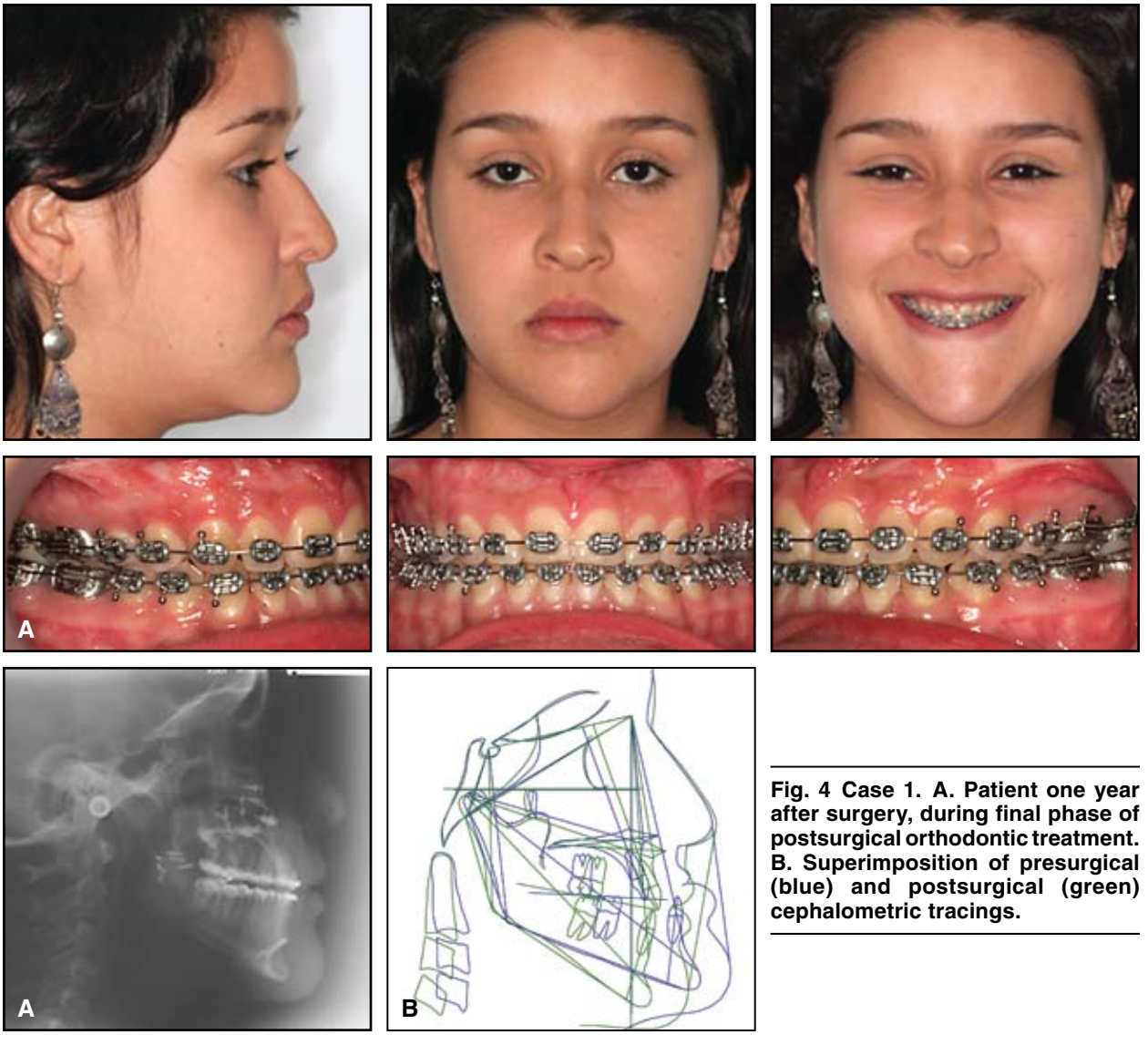

Fig. 4 Case 1. A. Patient one year after surgery, during final phase of postsurgical orthodontic treatment. B. Superimposition of presurgical (blue) and postsurgical (green) cephalometric tracings.

top 3-5mm of the condylar head, including the lateral and medial poles. A group of 25 young patients (average age at surgery 16.7, range 13-24) with active condylar hyperplasia showed greater stability after high condylectomy and orthognathic surgery compared to 12 patients with condylar hyperplasia (average age 17.5, range 13-24) treated with orthognathic surgery alone. The latter group relapsed into skeletal and occlusal Class III relationships and required repeated interventions.[25] The high condylectomies had no adverse effects on the TMJ or subjective jaw function.

After one year of postsurgical orthodontic treatment (Fig. 4), the patient had reached the end of her peripubertal growth period (CS 6).

Follow-up evaluation 41 months after surgery (Fig. 5) revealed stable occlusal relationships and good dentoskeletal balance (maxillomandibu-

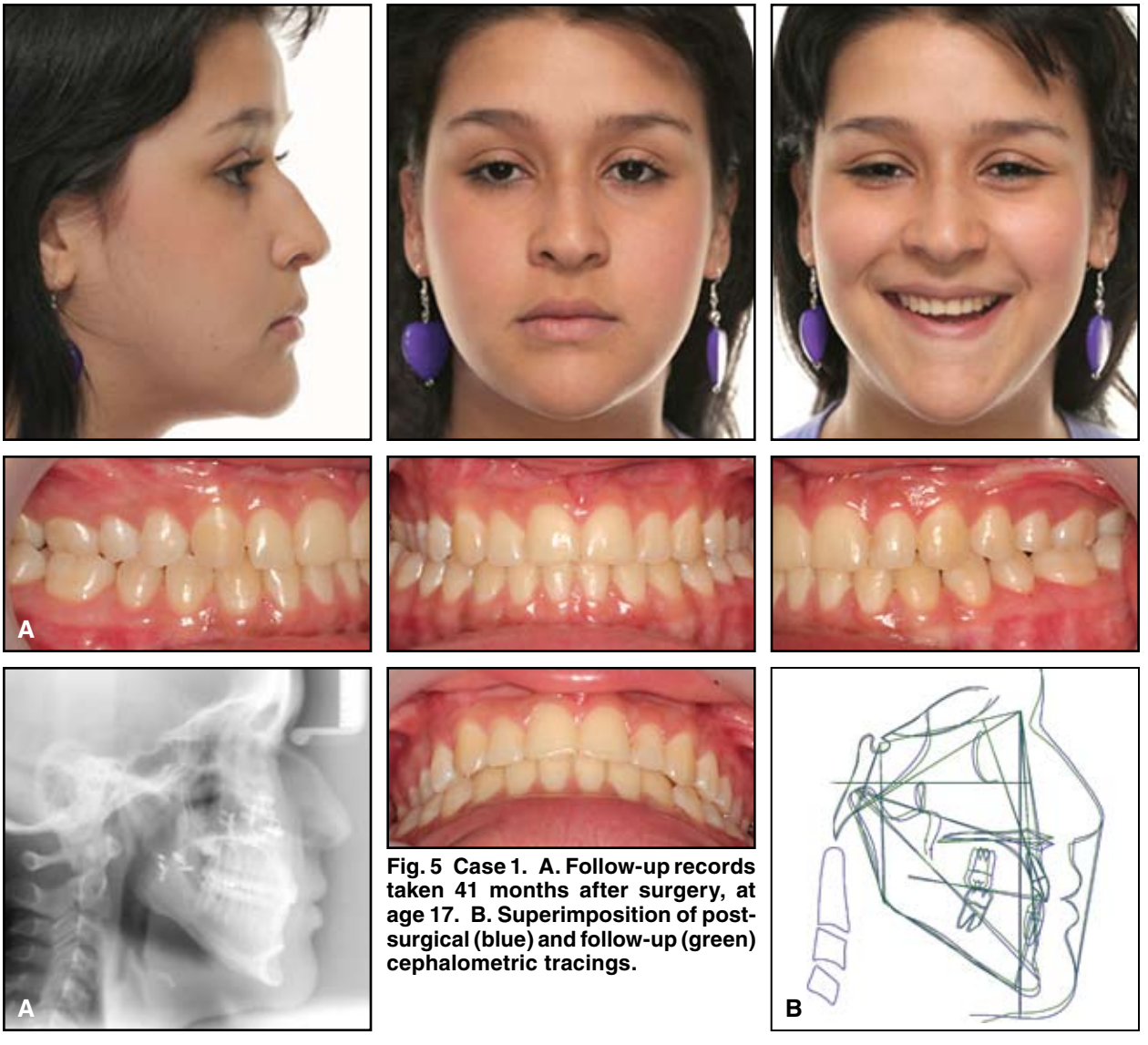

Fig. 5 Case 1. A. Follow-up records taken 41 months after surgery, at age 17. B. Superimposition of postsurgical (blue) and follow-up (green) cephalometric tracings.

lar differential = 29mm, ANB = 3°, SNB = 82°, total mandibular length = 122mm, overjet = 2mm). The patient was highly satisfied with her facial appearance.

Case 2

A 12-year-old female presented in the late mixed dentition, at a CS 3 stage of skeletal maturation (Fig. 6). Her chief complaints were her facial appearance and occlusal relationships. Despite having undergone orthopedic treatment with a facial mask for some three years, she displayed a Class III sagittal maxillomandibular discrepancy (maxillomandibular differential = 33mm, ANB = –2°), mandibular prognathism (SNB = 85°), deficient midfacial length (82mm), and a slightly positive overjet (1mm). The parents were anxious

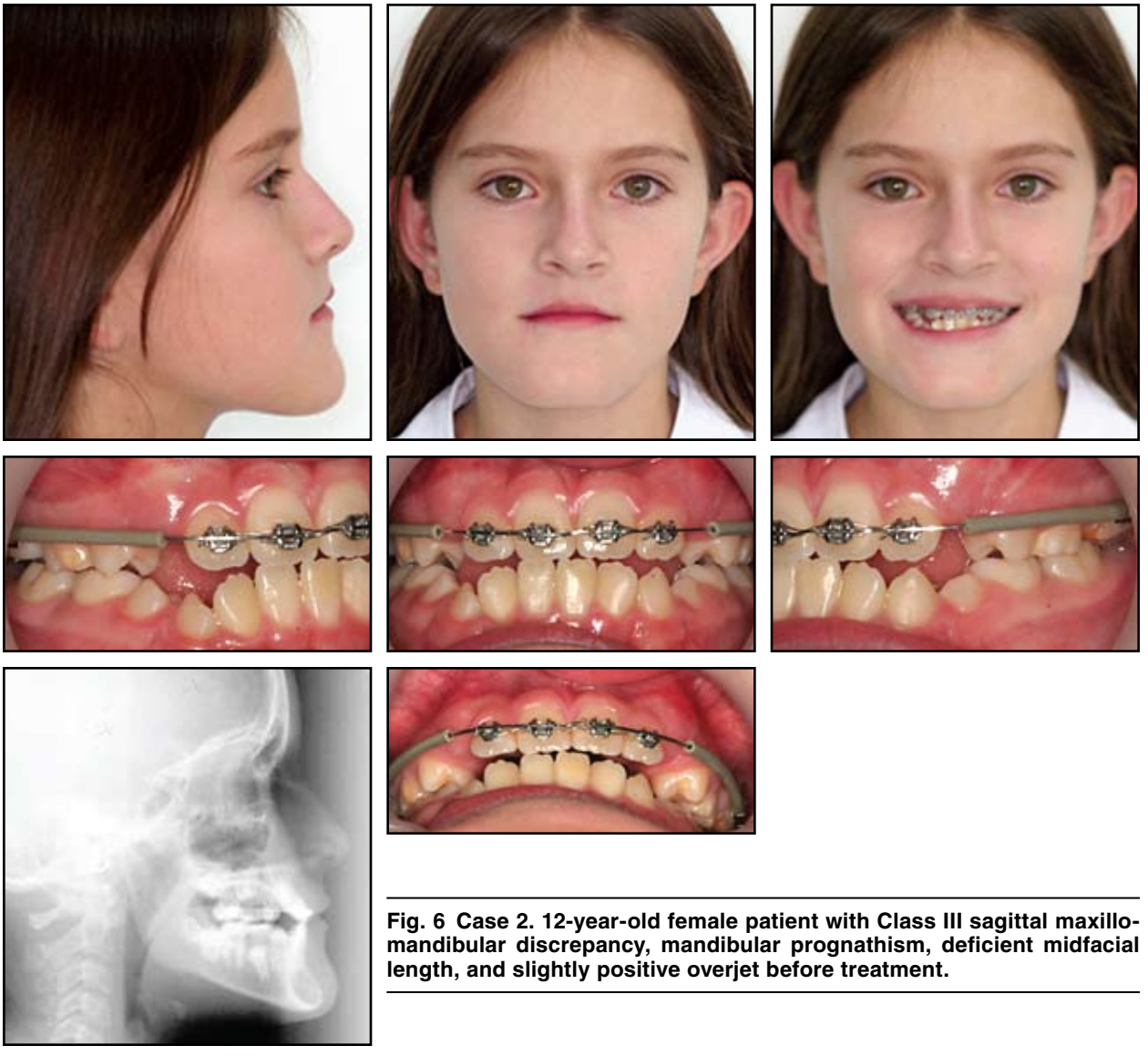

Fig. 6 Case 2. 12-year-old female patient with Class III sagittal maxillomandibular discrepancy, mandibular prognathism, deficient midfacial length, and slightly positive overjet before treatment.

about their daughter's facial appearance and motivated to consider an early surgical intervention. Prediction analysis of her craniofacial features showed that she was not a good candidate for a continued orthopedic approach (IS = 31.4).[9]

After three months of presurgical orthodontic treatment, the patient remained in the late mixed dentition, and the lower arch had not yet been leveled and aligned (Fig. 7). Correction of the lower crowding was therefore postponed until after surgery, which would include correction of the overjet. This "surgery-first" approach can limit the need for dentoalveolar decompensation and thus avoid worsening the patient's facial appearance before surgery.[26-29] We calculated the required amount of overcorrection by performing a model setup.

Five months later, in the CS 5 stage, the

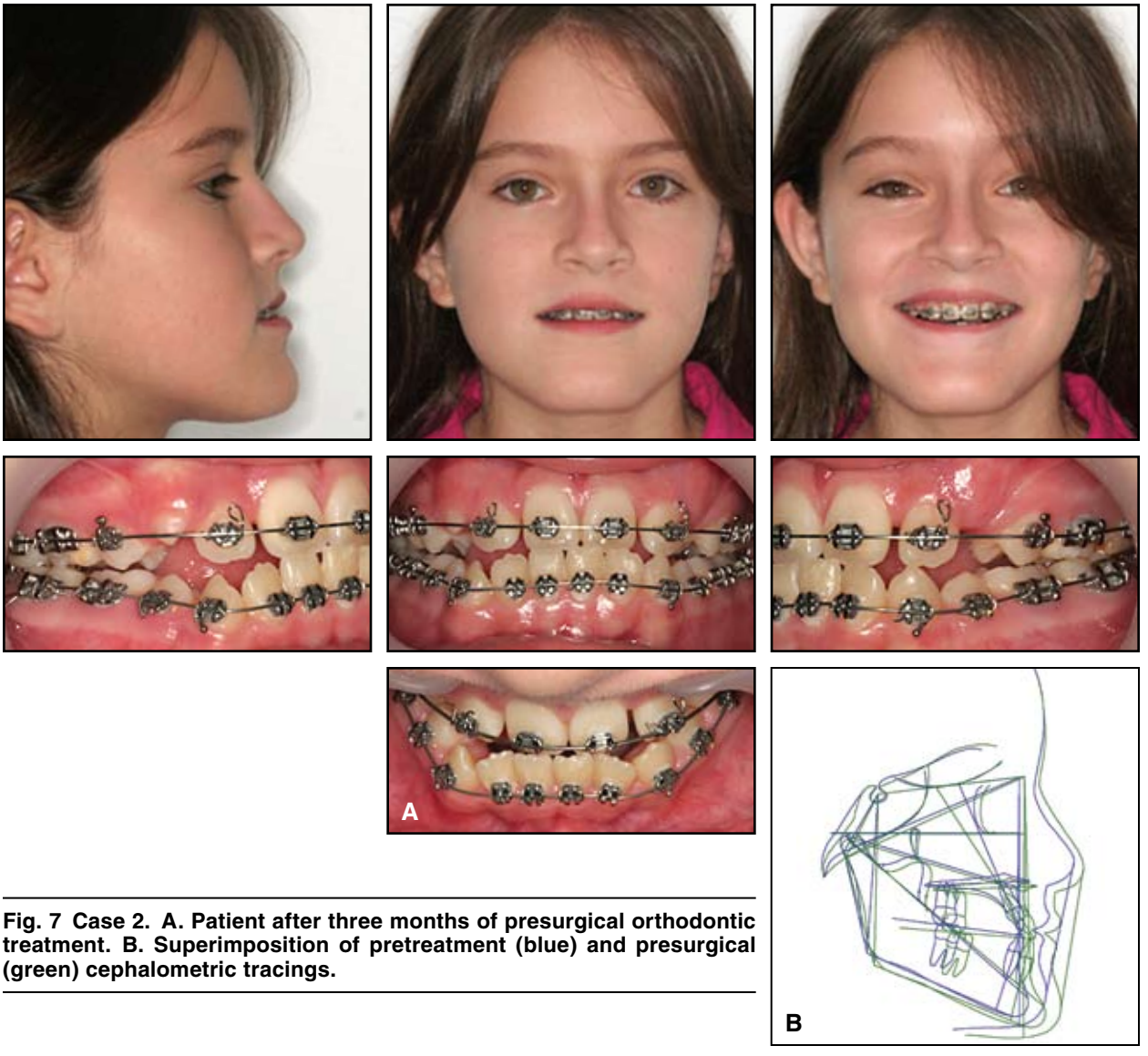

Fig. 7 Case 2. A. Patient after three months of presurgical orthodontic treatment. B. Superimposition of pretreatment (blue) and presurgical (green) cephalometric tracings.

patient underwent a high Le Fort I osteotomy for maxillary advancement (6mm) and a setback genioplasty (4mm; Fig. 8). Postsurgical orthodontic therapy took 16 months (Fig. 9A). One year later, two and a half years after surgery (CS 6), the patient showed a good profile and acceptable occlusion (Fig. 9B). Despite some residual mandibular growth (3mm), the correction of the mid-

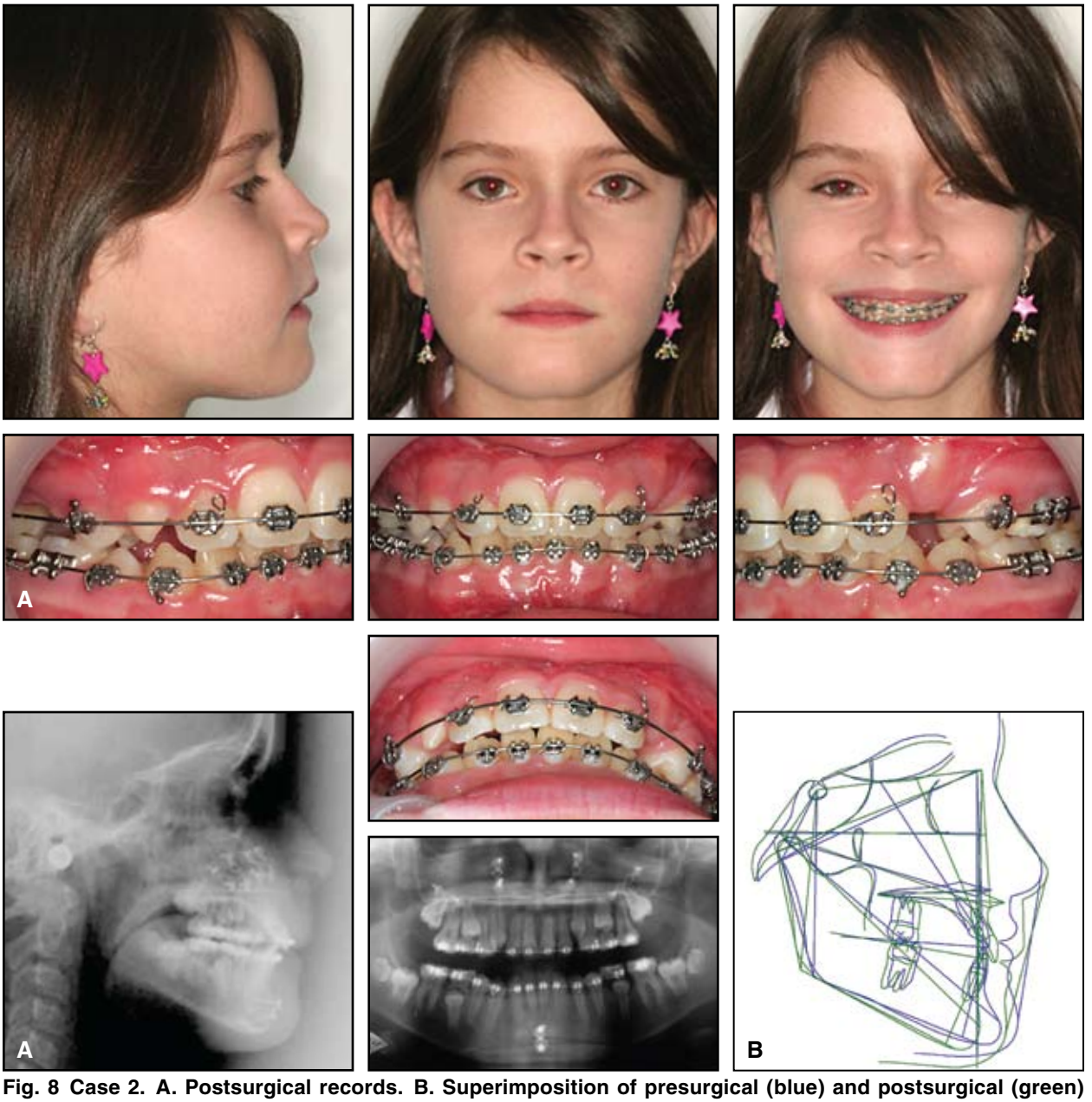

Fig. 8 Case 2. A. Postsurgical records. B. Superimposition of presurgical (blue) and postsurgical (green) cephalometric tracings.

facial deficiency remained stable (midfacial length = 90mm).

Case 3

A 12-year-old female in the permanent dentition (CS 3) presented with a concave profile and complaints about her facial appearance and occlusion (Fig. 10A). Although she had been treated between ages 6 and 9 with a rapid maxillary expander and facial mask (Fig. 10B), she still showed a Class III sagittal maxillomandibular discrepancy (maxillomandibular differential = 34mm, ANB = −3°), mandibular prognathism (SNB = 82°), deficient midfacial length (86mm), and negative overjet (−3mm). Analysis of her craniofacial configuration confirmed that she was a candidate for surgical correction (IS = 31.8).[9]

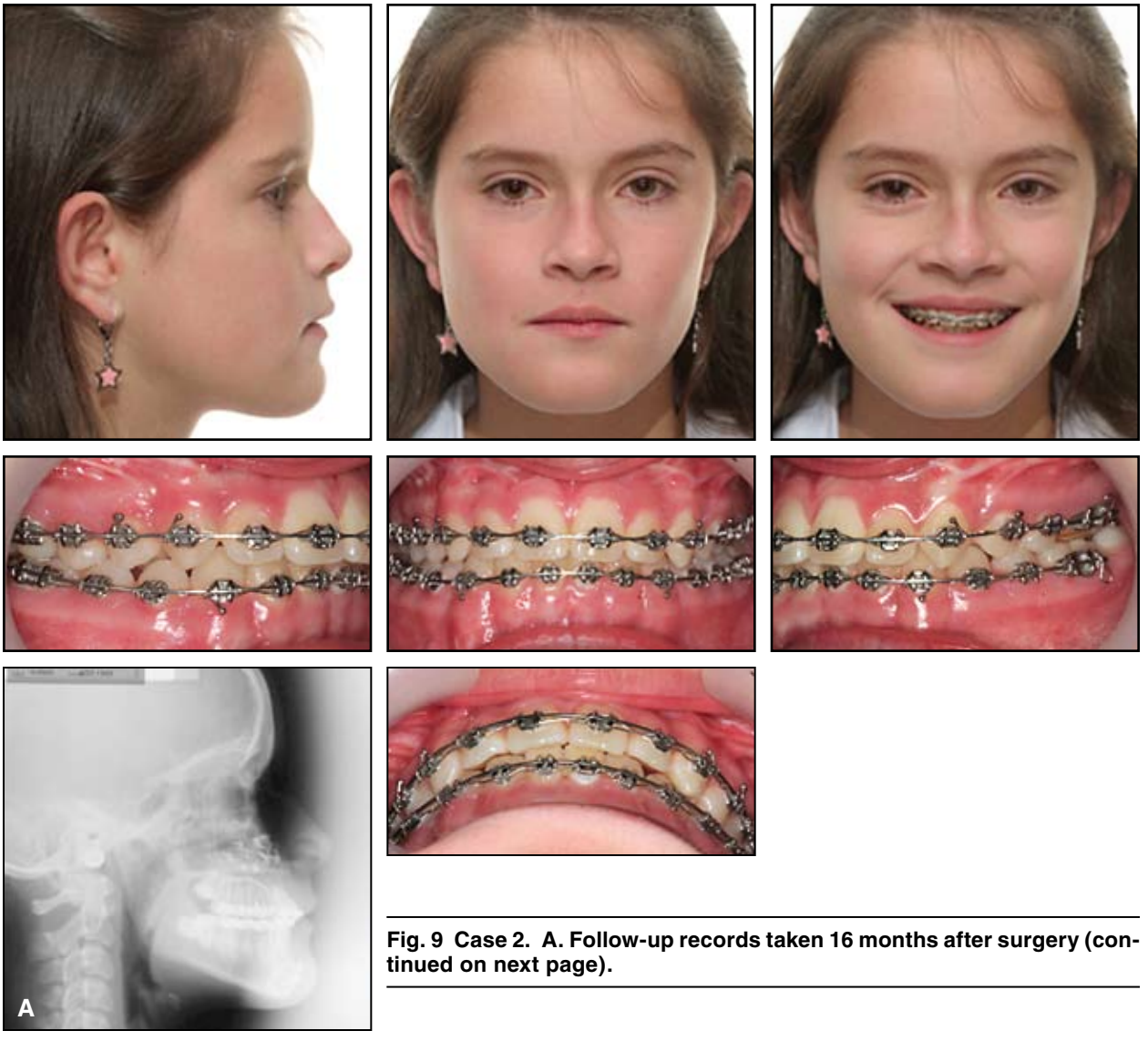

Fig. 9 Case 2. A. Follow-up records taken 16 months after surgery (continued on next page).

After extraction of the maxillary first premolars, presurgical orthodontic treatment was completed in 22 months (Fig. 11). At that time, the patient was postpubertal (CS 4) and ready for surgical intervention. Surgery included a high Le Fort I osteotomy for maxillary advancement (4mm), maxillary impaction (2mm), and bilateral sagittal split osteotomy for mandibular retraction (5mm). The skeletal misalignment was overcorrected in the sagittal plane, as could be seen in her slightly convex profile (Fig. 12), to compensate for expected mandibular growth after surgery.

Postsurgical orthodontic treatment lasted 12 months. Follow-up records taken six years after

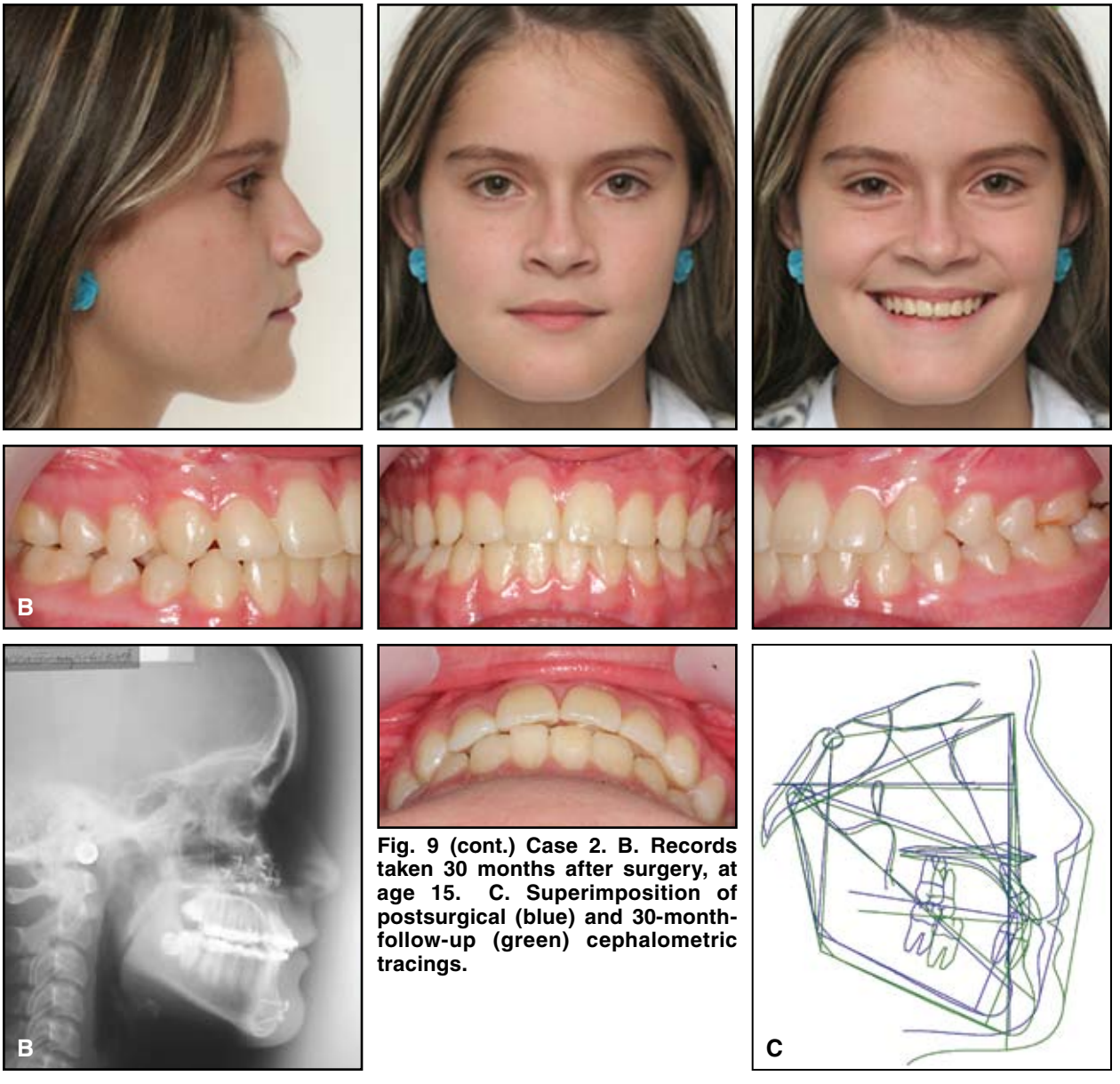

Fig. 9 (cont.) Case 2. B. Records taken 30 months after surgery, at age 15. C. Superimposition of postsurgical (blue) and 30-month-follow-up (green) cephalometric tracings.

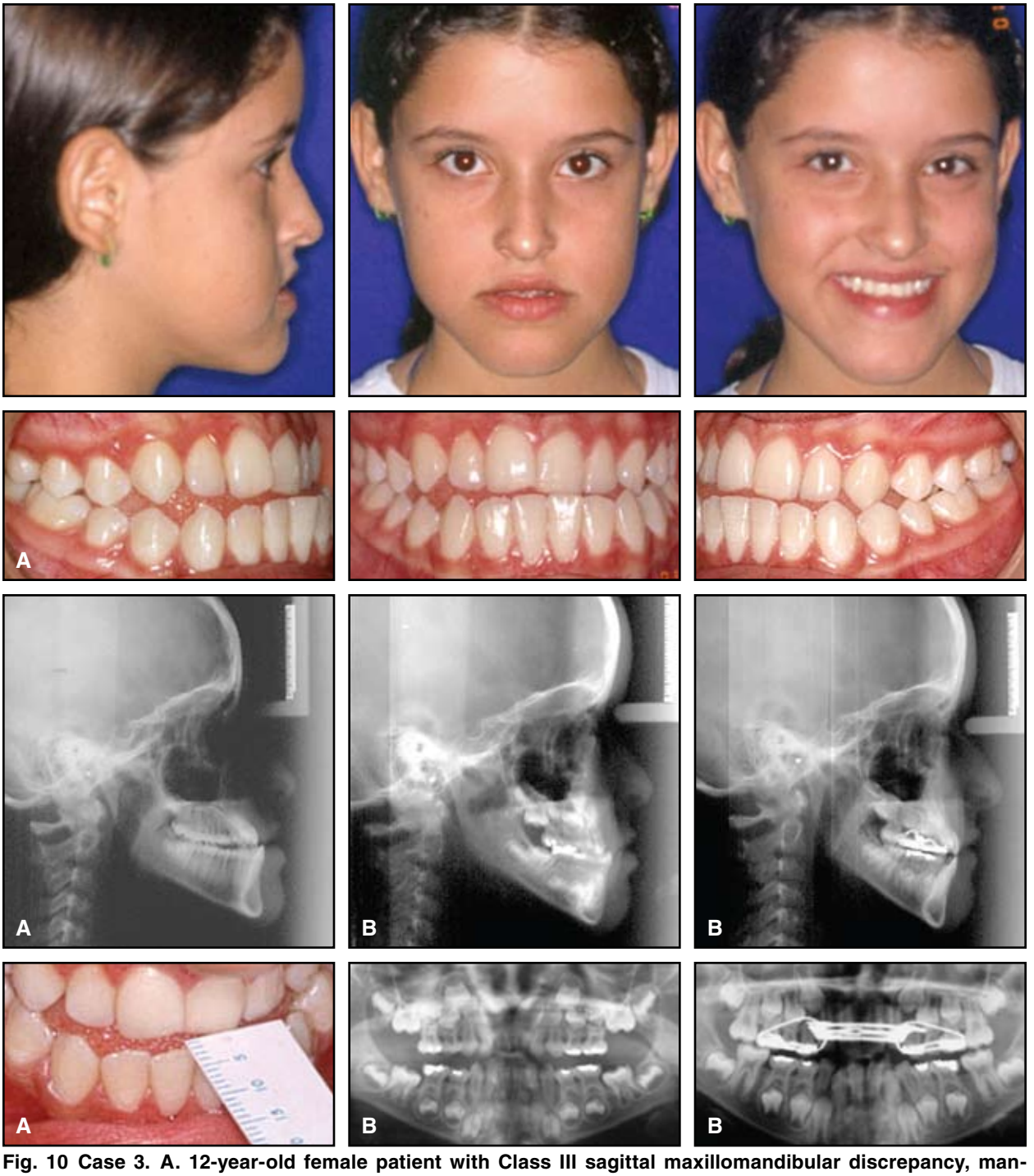

Fig. 10 Case 3. A. 12-year-old female patient with Class III sagittal maxillomandibular discrepancy, mandibular prognathism, deficient midfacial length, and negative overjet before treatment. B. Records from previous orthodontic treatment, between ages 6 and 9.

surgery (Fig. 13) showed stable occlusal relationships and dentoskeletal balance (maxillomandibular differential = 27mm, ANB = 5°, SNB = 77°, midfacial length = 94mm, total mandibular length = 121mm, overjet = 2mm), despite postsurgical mandibular growth that projected the bony chin forward by 4mm. The patient was entirely pleased with the surgical outcome.

Conclusion

This case series suggests that favorable long-term outcomes can be achieved with early surgical intervention in growing Class III patients. The following factors should be considered:

1. Early surgery is indicated in growing Class III patients with severe dentoskeletal misalignment who are unlikely to respond well to orthopedic

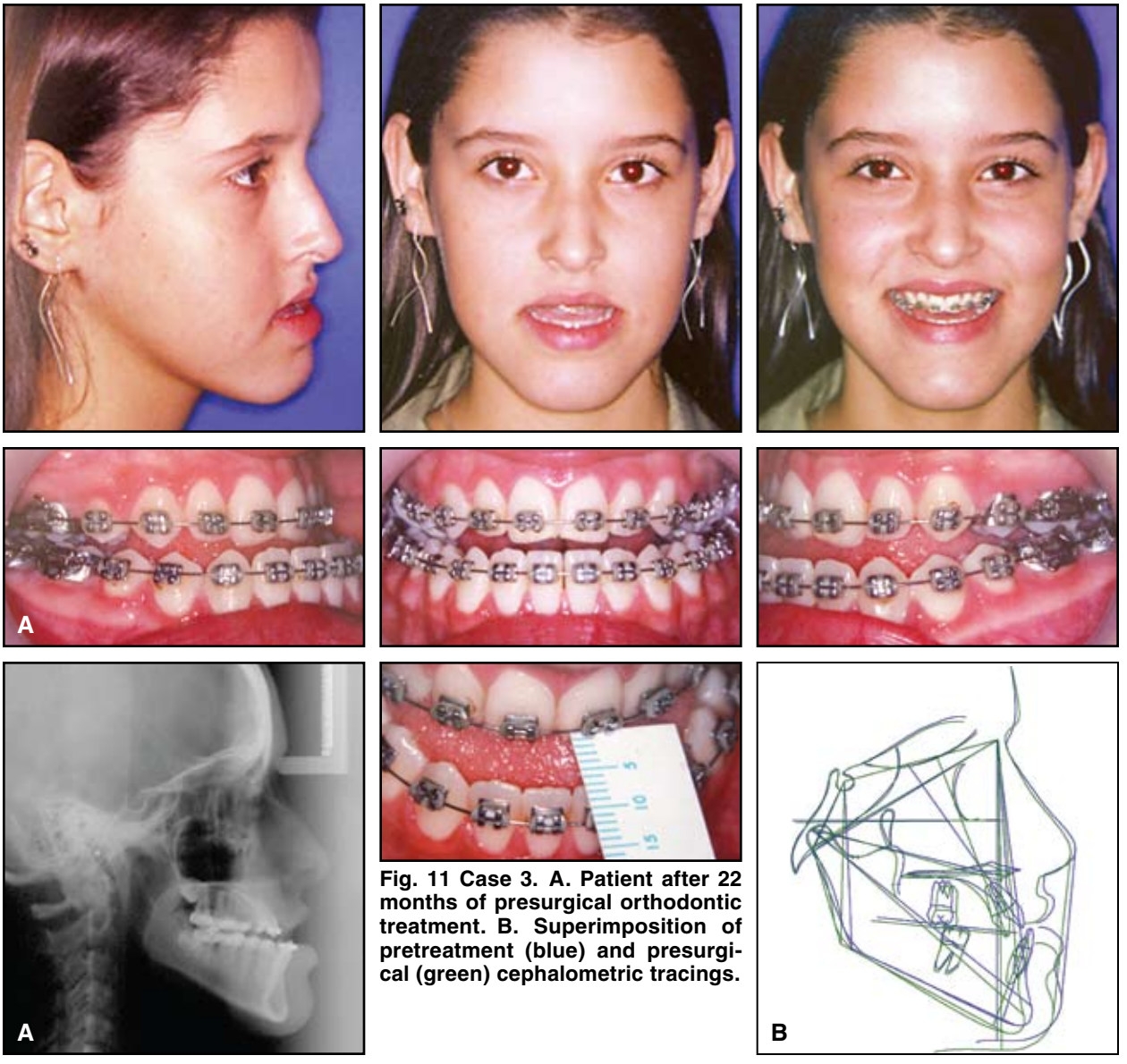

Fig. 11 Case 3. A. Patient after 22 months of presurgical orthodontic treatment. B. Superimposition of pretreatment (blue) and presurgical (green) cephalometric tracings.

treatment, based on prediction analysis of their craniofacial characteristics.[9]

2. The optimal timing for early Class III surgery is during the postpubertal phase of the adolescent growth spurt.
3. During presurgical orthodontic treatment, decompensation must be at least adequate, or preferably slightly excessive, to counteract anticipated postsurgical mandibular growth.
4. When orthognathic surgery is performed in the late mixed dentition, as in Case 2, a mandibular sagittal split osteotomy should be avoided because of the risk of damage to the germs of the second molars during surgery and the increased risk of fractures if repeat surgery is required.
5. Early Class III surgery might be particularly valuable for female adolescents, given the potential for a significant psychosocial benefit from an improved appearance. Girls mature earlier than boys and thus undergo less mandibular growth in the postpubertal period,[30] which might translate into a more stable surgical result.

The possibility of undertaking early surgery in Class III patients should always be evaluated with caution, and informed consent is mandatory. Since true Class III growth continues during adolescence and the early adult years, there must be a mitigating circumstance, such as a patient's significant psychological need or desire, to justify early treatment.

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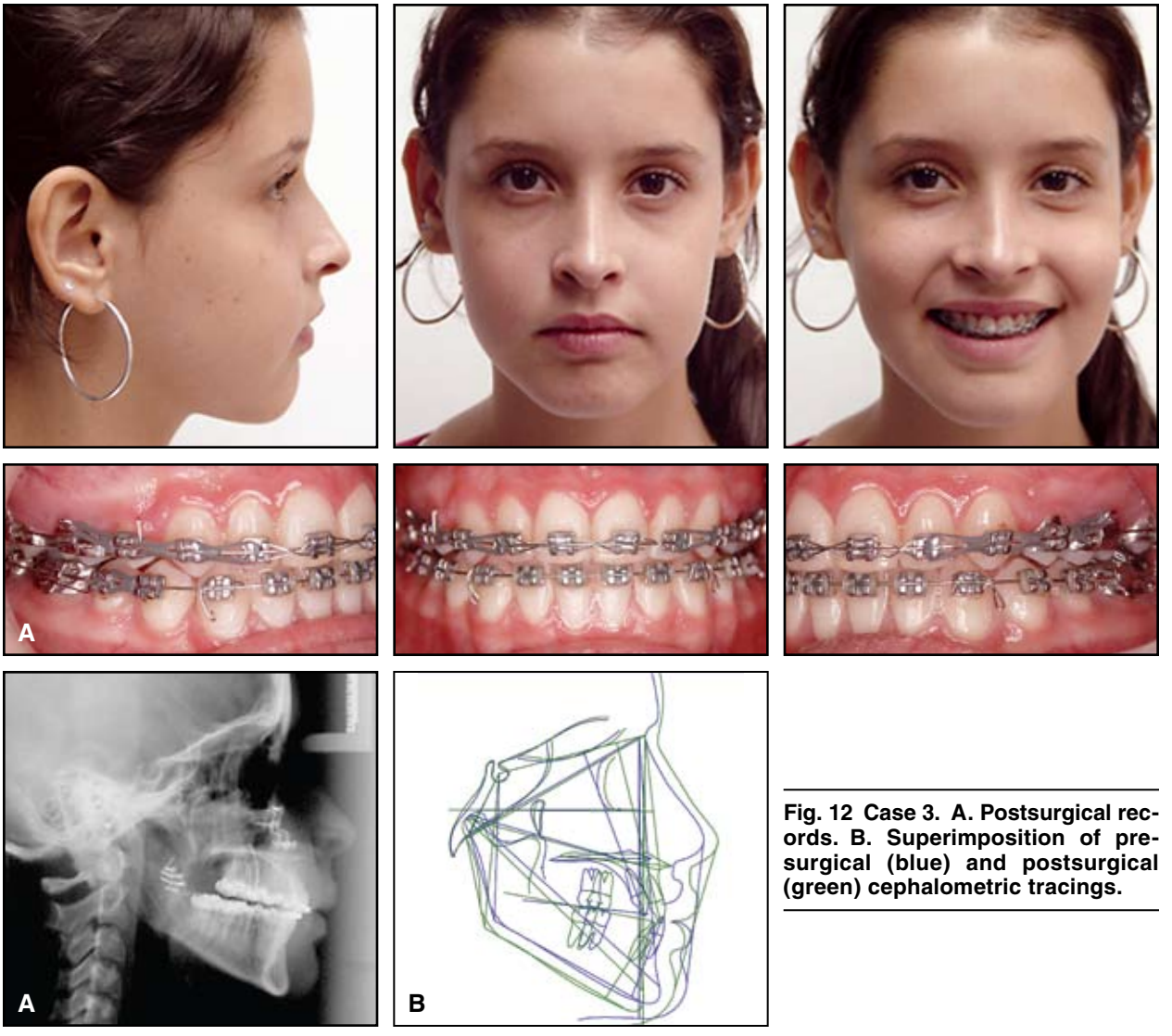

Fig. 12 Case 3. A. Postsurgical records. B. Superimposition of presurgical (blue) and postsurgical (green) cephalometric tracings.

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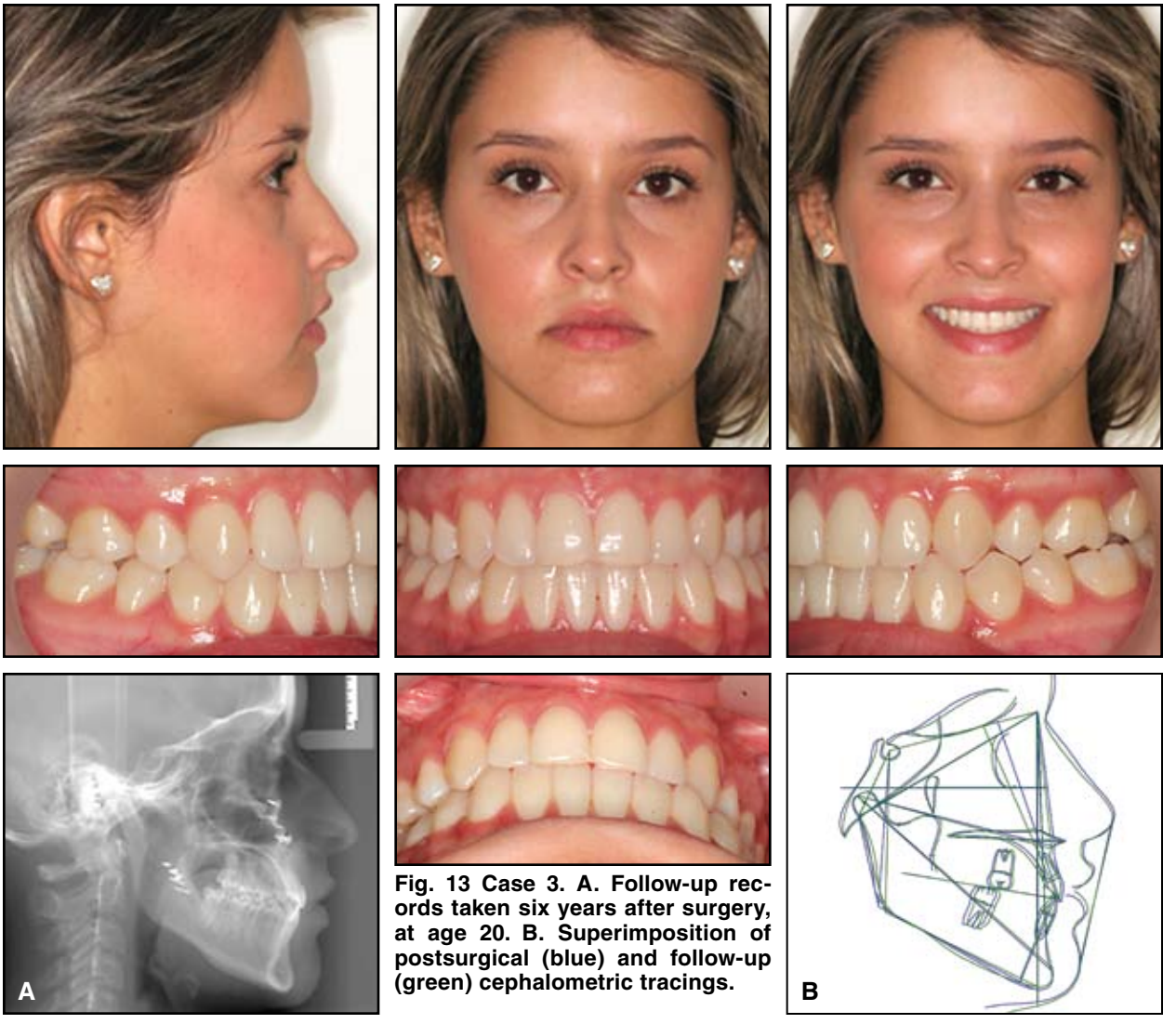

Fig. 13 Case 3. A. Follow-up records taken six years after surgery, at age 20. B. Superimposition of postsurgical (blue) and follow-up (green) cephalometric tracings.

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