

BEDDTIOT: The state of the art, 1980

Richard A. Hocevar, D.M.D., Dunedin, New Zealand

Abstract

The Begg-Edgewise Diagnosis Determined Totally Individualized Orthodontic Technique was developed in an attempt to assimilate and enhance the best aspects of the Begg and various Edgewise techniques, and to eliminate their deficiencies. The appliance is a combination of six different narrow brackets with horizontal slots (.022" × .028") and 0°, 3°, 7°, 11°, 17° and 22° degrees of torque. The brackets have a vertical slot (.020" × .020") for auxiliary springs. In some cases double Edgewise buccal tubes (.022" × .028") on molar teeth are used with about 24° of angulation between the two tubes; triple tubes may be employed if required in the upper arch for extra-oral force. The appliance is illustrated with the records of seven cases presented, including non-extraction and extraction treatment plans. The cases illustrate the technique's utilization in minimum, moderate and maximum anchorage situations, and various combinations of elastics, together with sectional Edgewise wires. The use of square and ribbon arch wires in preference to Edgewise configurations is also discussed.

Key Words: Appliances, Begg-Edgewise, pre-torque brackets, anchorage control.

INTRODUCTION

The 'philosophy' of the BEDDTIOT technique is based upon several important principles. The determination and attainment of treatment goals depends upon an orthodontist's

- (i) interpretation of diagnostic criteria,
- (ii) subjective evaluation of biologic and aesthetic parameters, and
- (iii) virtuosity in the selection and application of biomechanical principles.

An appliance system should afford the simplest mechanical means of allowing the orthodontist to perform the desired types of tooth movements; be sufficiently versatile to provide the facility of adaptation for treating each case individually and operate in the most efficient manner possible. While no single type of appliance can be best for every situation, BEDDTIOT — a combination of Begg and Edgewise techniques — seems to offer advantages, both in its logic and its clinical applications, over most other techniques in most situations. The BEDDTIOT attachments are convenient to use and may be used in varied adaptations of the appliance to suit particular case requirements.

The basic components and applications of the system have been described and brief comparisons with other techniques have been made elsewhere (Hocevar, 1979). The BEDDTIOT attachments have allowed the author far easier application of the Begg technique in those cases in which it is indicated, while facilitating a combined Begg-Edgewise approach in other types of cases. Bracket width, an important factor in determining the force level and range inherent in an 'Edgewise' appliance (Thurrow, 1972; Schudy et al., 1975; Creekmore, 1976; and Hocevar, 1981a) has

been kept to a minimum. A small bracket width allows tipping where desired and also yields maximum interbracket spans of archwire to keep force levels within desirable limits.

APPLIANCE DESCRIPTION

Attachments

Brackets: BEDDTIOT brackets are narrow, single-width (.050 in./1.3 mm) Edgewise brackets with a slot height of .022 in. and a facio-lingual depth of .028 in. (i.e., .022" × .028"). These horizontal archwire slots are 'pre-torqued', as shown in Figure 1, so that they may be orientated on each tooth parallel to the occlusal plane when the teeth are properly positioned. Table 1 illustrates the standard torque utilized for each tooth.

Table 1. Standard BEDDTIOT Bracket Torque

Maxilla	−7°	−3°	7°	7°	7°	10°
TOOTH	1's	2's	3's	4's	5's	6's
Mandible	0	0	11°	17°	22°	25°

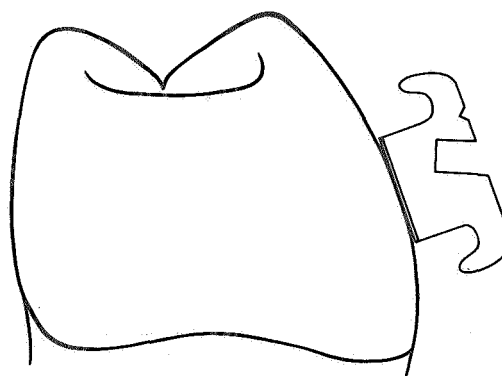


Figure 1 BEDDTIOT bracket with 22° lingual crown torque on a mandibular premolar.

Notice that whilst there are six different brackets used, with 0°, 3°, 7°, 11°, 17°, 22° (degrees) of torque, any of these pre-torqued brackets may be used on any tooth. This allows adaptation to suit any situation. The bracket may be positioned with the torque active either way, i.e., as in Figure 1 for lingual crown torque, or vice versa for lingual root torque. The notch in the bracket indicates torque direction. In addition to the horizontal slot, on its lingual side, i.e., against the band or bonding pad, is a .020" × .020" vertical slot (similar to a Begg, Chun Hoon or Broussard bracket). This vertical slot, as utilized in the Begg technique (Begg, 1956) has a wide variety of potential uses, including holding uprighting springs and various rotation mechanisms (Begg, 1956; Hocevar, 1979). This small, simple combination bracket provides a wide range of mechanical potential.

Tubes: Whilst the 'standard' .022 × .028 in. Edgewise molar tube is used routinely, in cases with deep overbites or moderate-to-severe anchorage requirements an additional tube is soldered diagonally across the buccal surface of the standard molar tube (Figure 2). The inner tube is placed horizontally at an ideal height coordinated with the rest of the brackets. The outer tube is angulated approximately 25° mesio-lingually (note that its mesial end is further lingual than its distal end is occlusal) to keep it and the archwire out of occlusion. This additional tube, its mesial end pointing gingivally, is used on the first molars of either or both maxillary and mandibular arches. In

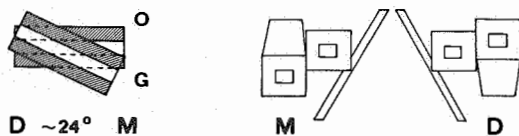


Figure 2 Diagrams of facial, mesial, and distal views of a double BEDDTIOT tube for a mandibular right molar.

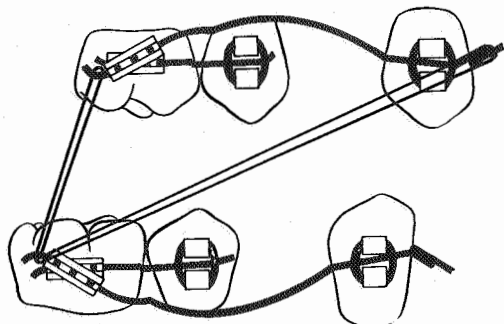


Figure 3 Typical BEDDTIOT set up for a maximum anchorage Class II deep bite four first premolar extraction case: .020 in. square molar-premolar sectional wires, .016 in. round archwires, and 2-2.5 oz. check elastics.

addition, headgear tubes may or may not be used on maxillary molars, thus making a triple tube assembly. The angulated additional Edgewise tube, i.e., the 'outer tube', is like the basic or 'inner tube', both being 4.5 mm long with .022 × .028 in. inside dimensions (Figure 2).

Combination Archwire Mechanics: The angulated outer tube carries the main working archwire, whilst during the bite-opening and retraction phases of treatment, heavy rectangular sectional wires in the molar inner tubes and the premolar brackets lock these two teeth together so neither can tip independently. This combination of working arches and anchorage stabilizing sectional wires is used for retraction and bite opening (Figure 3). Considerable force for incisor intrusion can be derived from this combination of archwires. The molars cannot tip distally without extruding the premolars. When 'check elastics' (Hocevar, 1977, 1981b, 1981c) are used they extrude the molars while reinforcing the anchor bends' depressing effect on the anteriors. When the posteriors are used as anchorage for incisor retraction, this combination of working and sectional wires means the molar cannot tip forward without intruding the premolar; nor can the premolar tip mesially, without extruding the molar. The gingivally angulated outer tubes direct the working archwires well out of the way of distortion from mastication and provide effective built-in 'anchor bend'. The fact that the bore of the Edgewise molar tube (.022" × .028") is so much smaller than a Begg tube (.036") means that much more subtle anchor and toe-in bends can be used and, overall, this combination of Edgewise tubes provides far easier and more certain molar control.

CASE REPORTS

The cases are presented in order of increasing anchorage potential determined by the individualized treatment plan, i.e., anchorage potential for retraction of anterior teeth and/or for alleviation of crowding:

- (i) Minimum anchorage potential—provided by a non-extraction approach; slightly increased anchorage potential by the extraction of maxillary second premolars.
- (ii) Moderate anchorage potential—gained by extraction of maxillary first premolars; by extraction of maxillary and mandibular second premolars; by extraction of maxillary and mandibular first molars.
- (iii) Maximum anchorage potential—derived by extraction of four first premolars; 'ultimate' anchorage by incisor extractions.

Headgear utilization and extraction of more than four teeth will not be illustrated in these case reports, although both are utilized. Some

illustrated cases have prototype BEDDTIOT attachments—brackets with Lewis rotation wings and/or outer molar tubes which are round and inadequately angulated. The Lewis rotation wings are now not used, they are unnecessary and a nuisance; the round molar tubes have been discarded as they are not nearly as versatile as rectangular tubes.

Non-extraction

Figure 4 (A) and (C) shows a 13-year-old girl with nearly a full Class II molar relationship and a profile that appeared somewhat 'dished-in' before treatment. The treatment plan was to achieve half of her overjet correction by anterior

movement of the mandibular dentition and half by maxillary incisor retraction, rather than total correction by excessive retraction of the maxillary dentition. The standard BEDDTIOT appliance was placed with single Edgewise tubes on the first molars (headgear tubes were placed on maxillary molars but were not used); maxillary premolars were never banded. Initially .016 in. round Begg-type archwires were used in both arches. Notice the simple correction of the upper right lateral by a gentle elastomeric thread pulling its bracket straight on to the archwire (Figure 4 (E)). After bracket alignment a heavy rectangular mandibular archwire with a little facial root torque for the lower incisors was utilized, thus making the lower arch one solid anchorage unit (Figure 4 (F)). Class II elastics were used throughout treatment and a .016 in. upper arch and a .019 × .026 in. lower arch remained throughout the successive stages of the treatment. Figure 4 (C) and (D) compares the 'before' with the 'after' intra-oral view with the completion of overbite, overjet and alignment correction. Figure 4 (F) shows the appliance at the end of treatment; the uprighting springs on the maxillary canines were the only auxiliaries required. The case was completed in 9.5 months from Figures 4 (A) to (B), 4 (C) to (D), and 4 (E) to (F). Comparison of pre- and post-treatment cephalograms showed 3 mm protraction of the

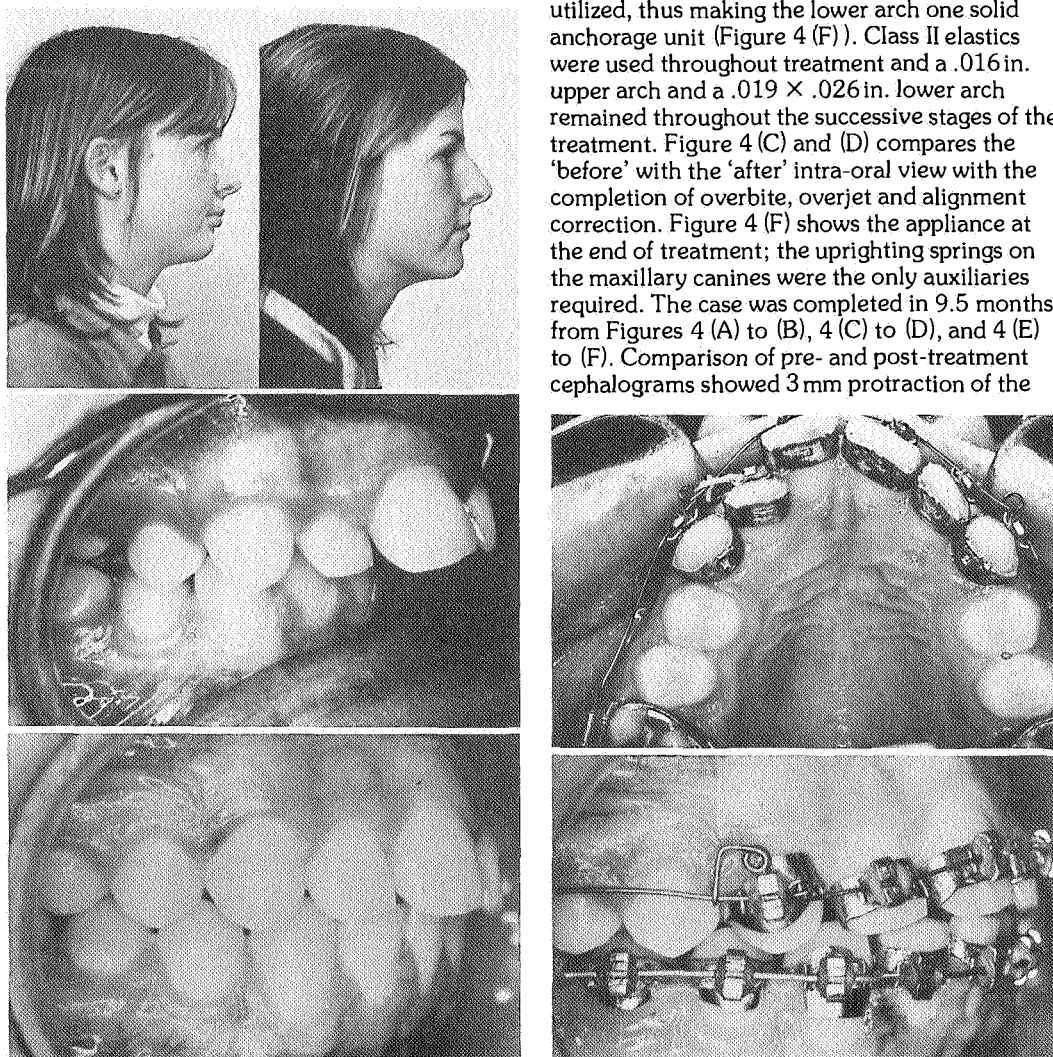


Figure 4 Case 1

- A — Profile pre-treatment.
- B — Profile post-treatment.
- C — Intraoral pre-treatment.
- D — Intraoral post-treatment, after 9 months.

- E — Appliances at placement with .016 in. archwires, Class II elastics and elastomeric thread to right lateral.
- F — Appliance at deband after 9 months, with .016 in. upper archwire and uprighting springs and .019 × .026 in. Edgewise lower wire.

lower incisors and 6 mm retraction of uppers relative to the 'facial plane' (nasion to pogonion).

Present concepts of BEDDTIOT principles would avoid having to bend facial root torque into the anterior portion of the lower archwire by using brackets with 7 or 11 degrees of facial root torque on the lower incisors. One of the advantages of the BEDDTIOT brackets is that because they are all interchangeable a little time spent in pre-planning allows the appliance to be fitted to the clinical requirements, thus saving time and effort in treatment mechanics. Individual teeth whose facial surfaces have atypical slopes can be accommodated by correct bracket selection.

Case 1 shows the use of a $.019 \times .026$ in. Edgewise wire, but this is virtually never used now (Hocevar, 1981b). One of the reasons for the development of the smaller ($.018'' \times .025''$) Edgewise bracket slot was that $.022 \times .028$ in. wires were far too rigid (Ricketts et al., 1979; Creekmore, 1976). The author considers there is rarely a need for heavy Edgewise wires to be used in the $.022 \times .028$ in. bracket slots. Precise control can be attained with lighter forces by using much more resilient square wires (e.g., $.020'' \times .020''$, $.021'' \times .021''$, or $.022'' \times .022''$) or rectangular wires (e.g., $.020'' \times .016''$ or $.022'' \times .016''$) used as ribbon arches. All the above wires are easier for the operator to work with and are also easier on the patient. It should be noted that a $.022 \times .016$ in. ribbon arch has just over half the cross-sectional area of a $.022 \times .028$ in. Edgewise arch, yet fits the slot of the bracket just as precisely (Figure 5); similarly a $.020 \times .016$ in. ribbon arch compares favourably with a $.019 \times .026$ in. Edgewise arch (Hocevar, 1981a).

Maxillary Second Premolar Extraction

Figure 6 shows Case 2 with congenital absence

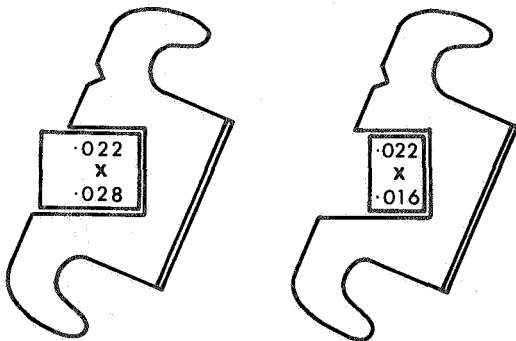


Figure 5 A $.022 \times .016$ in. ribbon archwire has just over half the cross-sectional area of a $.022 \times .028$ in. Edgewise archwire, yet provides the same precise control in all dimensions in an 'Edgewise' bracket.

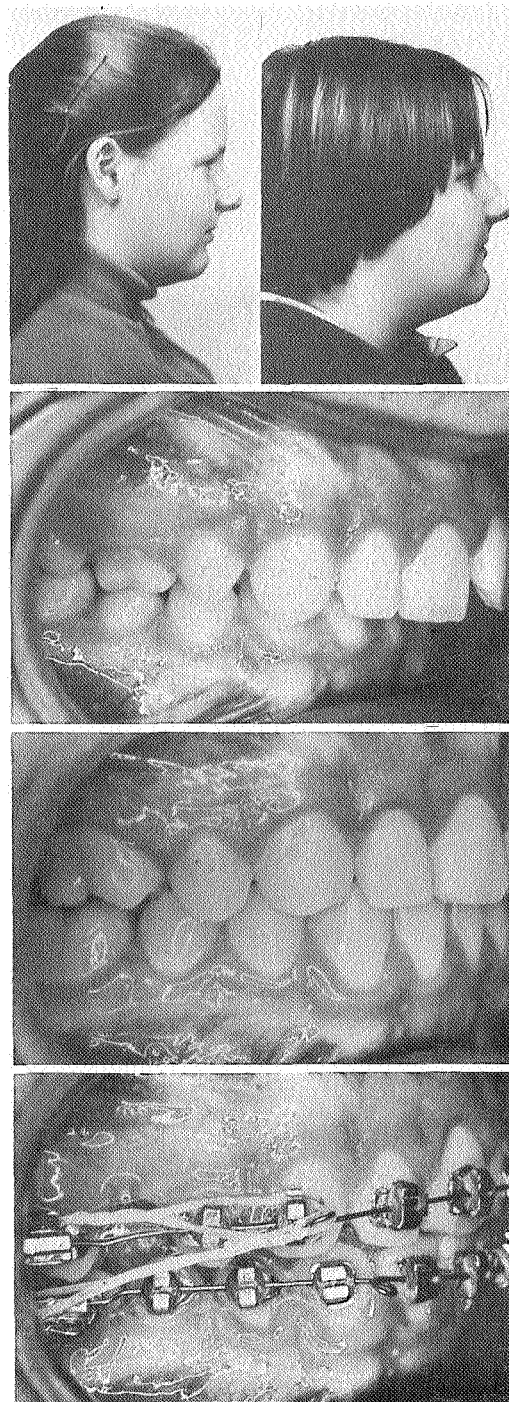


Figure 6 Case 2

- A — Profile pre-treatment.
- B — Profile post-treatment.
- C — Intraoral pre-treatment.
- D — Intraoral post-treatment, after 21 months of appliances and 8 months retention.
- E — After 4 months treatment with $.016$ in. round archwires, Class I elastics in upper arch, and Class II elastics.

of upper second premolars, providing anchorage from within the upper arch. Protraction of lower incisors should be minimal. This case would not normally have been an extraction case, so there was no requirement to bolster mandibular anchorage with a rectangular wire (Figure 6 (E), (F) and (G)). Braking mechanics—i.e., uprighting springs (Figure 6 (F) and (G)) a rectangular archwire (Figure 6 (F) and (G)), and then a torquing arch (Figure 6 (G))—were utilized early in the maxilla. Nevertheless, the lower incisors remained in their original relation to the facial plane, while the uppers were retracted 5 mm (Figure 6 (B) and (D)). Note the use of the vertical slot to accommodate an elastic hook (Figure 6 (F)), later replaced by crimp-on hook (Figure 6 (G)) to accommodate the canine uprighting spring. Initially Class I and Class II elastics were used together (Figure 6 (E)); then, when anchorage appeared excessive, heavy Class I elastics were used alone (Figures 6 (F) and (G)).

Maxillary First Premolar Extractions

Extraction of maxillary first premolars alone is

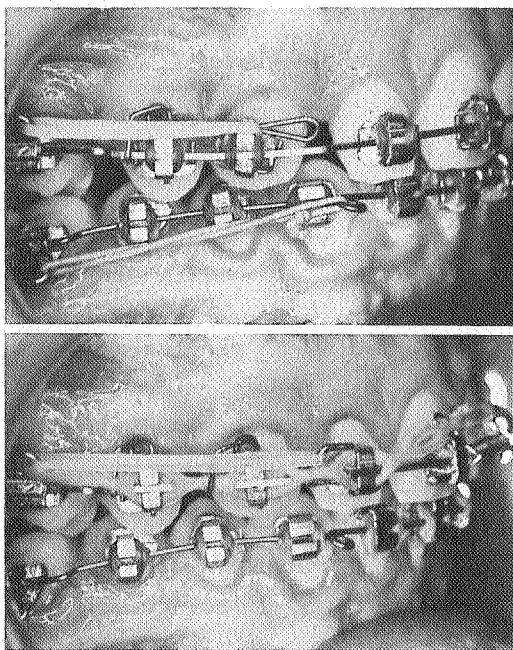


Figure 6 Case 2

- F — After 9 months treatment with .019 × .019 in. square upper archwire, upper first premolar uprighting springs, and 6 oz. Class I elastics to move molars mesially. Note that canine and premolars slid freely along the archwire opening spaces mesial to canines. Spacing of incisors should be controlled by an elastomeric chain.
- G — After 14 months treatment. Space closure by elastomeric chain and final root positioning. Class I elastics, uprighting springs on canines and premolars and von der Heydt torquing auxiliary wire on the incisors.

the author's standard approach for Class II—Division I patients with the lower arch well aligned and the lower incisors in the desired antero-posterior position (Figure 7). Similarly maxillary extractions only are used where alleviation of mandibular crowding or spacing will cause fore or aft movement of the lower incisors into the desired position. In these one-arch extraction cases retraction of the six maxillary anteriors is accomplished utilizing anchorage from maxillary posteriors and the intact mandibular dentition without effecting any protraction of the mandibular anchorage units. This is the general treatment plan unless the overjet is extremely severe. If the overjet is so large that the premolar extraction space is obliterated before the overjet is fully reduced then, for the remainder of that treatment, as in non-extraction cases, the arches are pitted against each other, with some protraction of the mandibular dentition expected unless additional anchorage, either by headgear utilization or more extraction, is invoked. Where the premolar extraction plus any spacing of the maxillary anteriors provide enough room for the overjet reduction, as many as 20 maxillary and mandibular teeth are pitted against the six maxillary anteriors; as a consequence, and by employing light forces, it is easy to avoid anchorage loss. This maxillary arch only extraction pattern also permits the use of sectional arches to lock the maxillary premolar and molar together when anchorage demands are stringent, and, especially, when the overbite is deep.

Case 3: In six months of treatment this young adult female's overjet and overbite (Figures 7 (A) and (C)) were corrected by using Class II inter-arch elastics approximately every other month and intra-maxillary Class I elastics the rest of the time (Figure 7 (F)). After 6 months auxiliaries were placed (Figure 7 (F)) to begin root movement in the upper anteriors while space closure continued (Figure 7 (F)). Her treatment was completed in fourteen months (Figure 7 (A) to (B), (C) to (D)); her lower incisors remained in their original antero-posterior positions (Figure 7 (C) to (D)).

Extraction of all Four First Molars or Second Premolars

These are two extraction patterns whose anchorage potential is roughly equivalent to the foregoing. The extraction of first molars is done only when they are in a poor condition or in some open bite cases where protraction of second molars can be beneficial. Normally four second molars are not removed in Class II cases, as extracting just upper first premolars yields an easier treatment; however, 'four 5's'

extractions are an alternative plan when one or more '5's are missing.

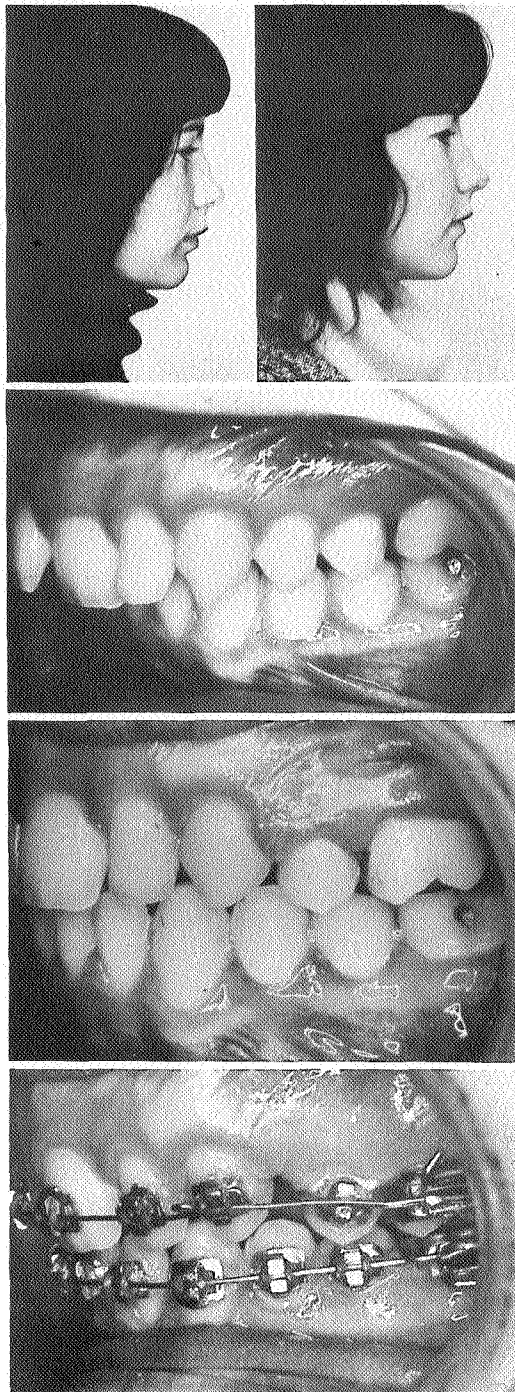
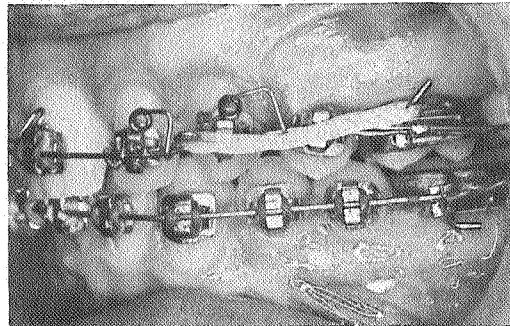


Figure 7 Case 3
A — Profile pre-treatment.
B — Profile post-treatment.
C — Intraoral pre-treatment.
D — Intraoral post-treatment, after 14 months treatment.

E — After 6 months treatment, .016in. round upper archwire with maxillary sectionals in premolars and molars and Class II elastics to a .022 x .016in. ribbon lower archwire.



F — After 10 months treatment, uprighting springs on lateral incisors and canines, von der Heydt torquing auxiliary wire and maxillary Class I elastics utilizing remaining maxillary space as anchorage.

Case 4: The treatment plan encompassing extraction of 'four 5's' is a common approach for Class I cases with mild-to-moderate crowding. This 12-year-old girl (Figure 8 (A)) had lost the lower left first premolar, extracted previously by her general dentist, so the lower midline was about 3 mm off to her left and the left canines and premolars were in a Class II relationship (Figure 8 (C)). The second premolars in the other three quadrants were extracted, the teeth aligned and the spaces closed on .016in. round wires. Stage III (Figure 8 (E) and (F)) included conventional uprighting springs and a torquing auxiliary, with .018in. archwires; a rotating

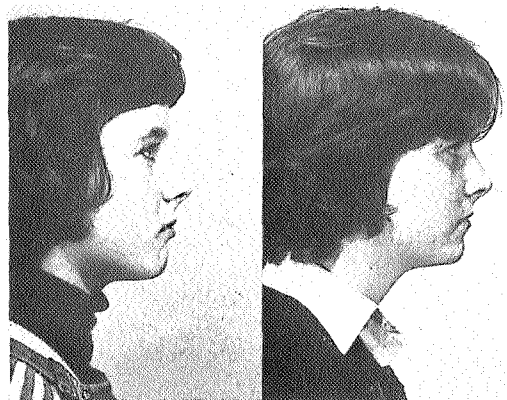


Figure 8 Case 4
A — Profile pre-treatment.
B — Profile post-treatment.

spring was used briefly on the upper right central (Figure 8 (E)). Treatment was completed in 14 months (Figures 8 (A) to (B), (C) to (D)).

Extraction of all Four First Premolars

Case 5: Minimal anchorage requirement. There are cases with anchorage to spare (Figure 9 (A))

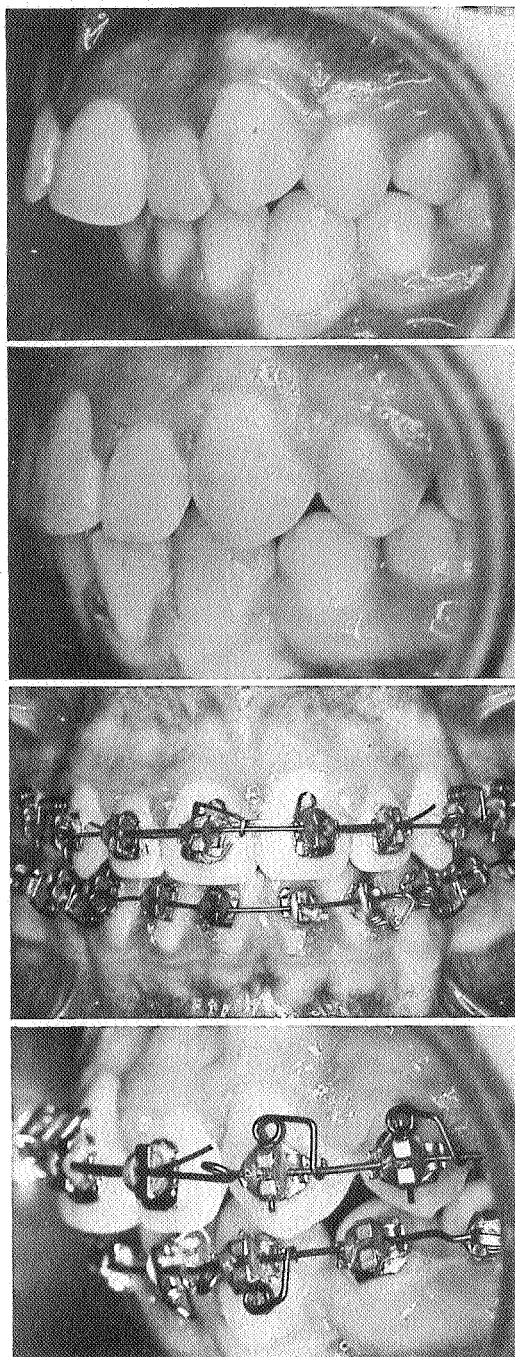


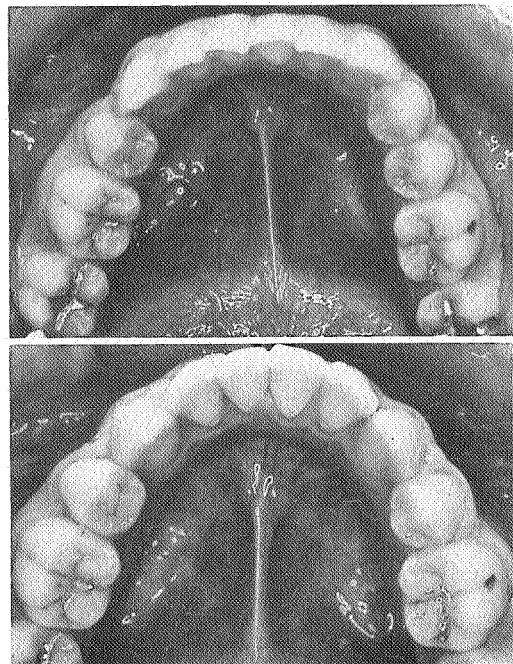
Figure 8 Case 4

C — Intraoral pre-treatment.

D — Intraoral post-treatment at debonding, 14 months of treatment.

E — Frontal intraoral after 10 months—Stage III nearly complete with .016in. upper and lower archwires, uprighting springs on canines and premolars and torquing auxiliary on incisors.

F — Intraoral after 10 months—Buccal view.



G — Intraoral pre-treatment, showing loss of left first premolar and lower midline movement to left.

H — Intraoral post-treatment, lower arch, note centre line and space closure.

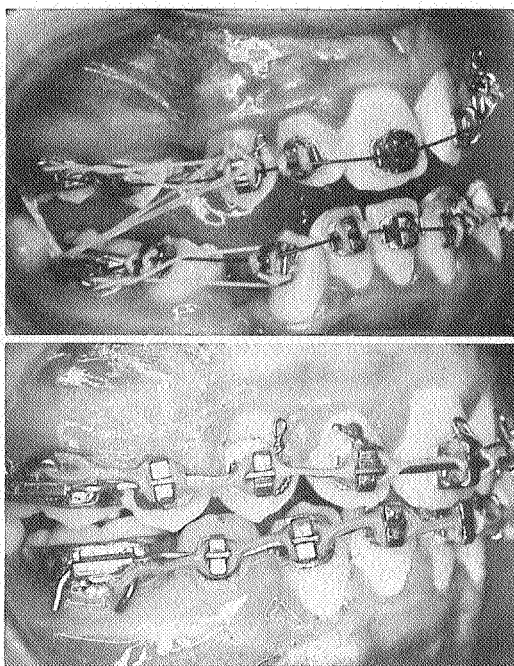
in which it is desirable to unravel the crowding and/or correct the Class II relationships and close the spaces by the most direct movement possible. Figure 9 (C), taken at the time the appliance was placed, but with the teeth apart, shows details of the 'check elastic' to open the bite, Class I intra-arch elastomeric threads directly to all four canines and elastomeric ligatures pulling malaligned 3's and incisors directly on to .012in. round archwires. Single molar tubes are used when neither overbite nor



Figure 9 Case 5

A — Profile pre-treatment.

B — Profile post-treatment.



C — Intraoral at start of treatment, with .012 in. upper and lower archwires, Class I intra arch elastomeric threads and Class II interarch check elastics.
D — Intraoral — after 16 months of treatment, elastomeric space closing chains, and von der Heydt torquing auxiliary wire on incisors.

anchorage requirements are severe. Figure 9 (D) shows torquing auxiliaries and .021 × .025 in. Nitinol arch wires. Notice the hi-hat pin in the vertical slot of the maxillary lateral for an anterior diagonal elastic for the correction of the midlines. If the brackets on the upper incisors had been selected with enough inbuilt torque, the torquing auxiliary might not have been necessary. Brackets used had -7° on the central incisors and -3° on the laterals, but brackets using -17° or -22° and -11° or -17° , respectively, would have been preferable. It should be remembered that some Edgewise torque effectiveness is lost in the play between the archwire and the bracket slot, and in the reduction of the force levels as the torqued wire returns to its passive state.

The author now rarely uses Nitinol wire, having found its disadvantages to outweigh its advantages (Hocevar, 1981a).

Moderate to Severe Anchorage Requirement

Case 6: Cases with greater anchorage requirements are treated using the principles of differential response to force in a manner very similar to the Begg technique. The patient in Figure 10 (A) and (C) has a 'bi-dental' protrusion with a Class II 'tendency', crowding and a deep

overbite; that is, there is a moderately severe anchorage requirement.

The case was started with 'twin' .010 in. archwires in each arch (Figure 10 (E)) achieving rapid, gentle alignment, molars and premolars being joined with rectangular sectional arches. The patient wore 2 oz. Class II interarch elastics during the first month (Figure 10 (E)) to the maxillary canines. Figure 10 (F) was taken after two more months of treatment, during which .016 in. round archwires had been in place with sectionals in each quadrant, with 2.5–3 oz. 'check elastics'. Alignment with slight over-corrections and reduction of overjet and overbite were completed.

For the next month light Class I Power Threads were used to close spaces. The maxilla was then set up for root movement, while mandibular space closure continued for the next six weeks (Figure 10 (G)), after which uprighting of mandibular teeth was begun while closure of the slight remaining space was completed (Figure 10 (H)). As a result of fourteen months of treatment (Figure 10 (A) to (B), (C) to (D)) the lower incisors remained in their original relation to the facial plane and the profile was improved considerably.

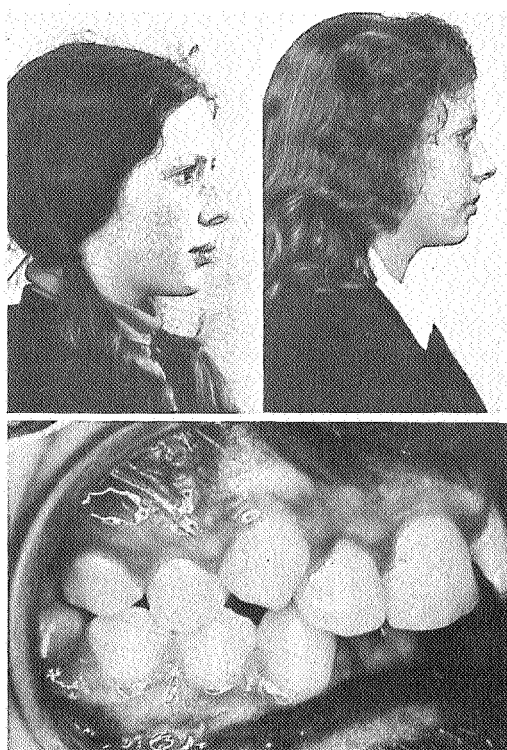


Figure 10 Case 6
A — Profile pre-treatment.
B — Profile post-treatment.
C — Intraoral pre-treatment.

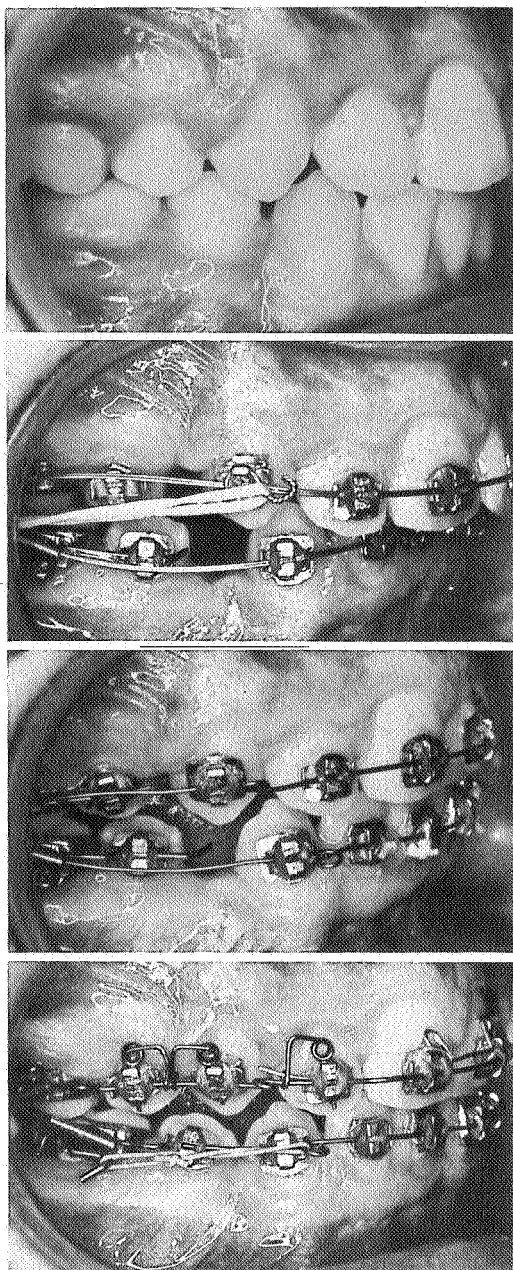
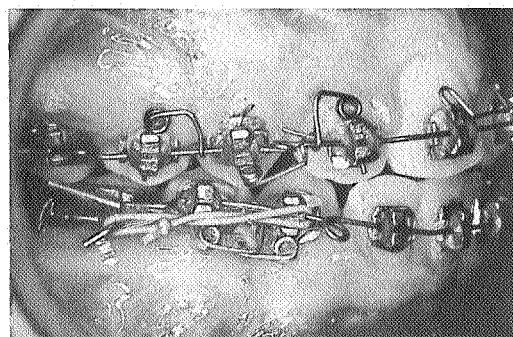


Figure 10 Case 6

- D — Intraoral post-treatment, 14.5 months of treatment.
 E — After 1 month's treatment, with twin .010 in. archwires in the upper and lower arches and Class II interarch elastics to upper canines; lower sectional wire between molar and premolar.
 F — After 3.5 months treatment, overjet almost reduced, round .016 in. upper and lower archwires, sectional wires in each quadrant between molar and premolar, and interarch check elastics (2.5–3 oz.).
 G — After 7 months treatment, Stage III uprighting springs on laterals, canines and premolars, von der Heydt torquing auxiliary on incisors, and lower elastomeric thread for space closure.



- H — After 13 months treatment, Stage III combination uprighting-rotating spring on upper canine, uprighting springs on upper premolars and laterals, von der Heydt torquing auxiliary wire on upper incisors, and reciprocal uprighting spring on lower canine and premolar; Stage III archwires are in the inner molar tubes.

Anterior Extractions — Maximum Anchorage Requirement

Where even more anchorage is required, bearing in mind the work of Riedel's group (Riedel, 1975), it seems reasonable to remove anterior teeth.

Case 7 (Figure 11 (A) and (D)), a severe Class II—Division I incisor relationship with impinging overbite and mandibular crowding, had upper 4's and lower laterals extracted. Brackets with 17° and 11° of lingual root torque were used on the upper centrals and laterals, with 11° and 17° of facial root torque on the lower incisors and canines, and with maxillary double tubes and sectionals. Because the mandibular buccal segments were intact, single lower molar tubes were used and an archwire with 'reverse curve of spee' or 'bite-opening' curve. After initial alignment, an .019 × .019 in. square lower archwire with some facial root torque bent into it was used for strength and control and to ensure that if lower anteriors moved forward they would have to do so apex first.

When maxillary spaces were closed an .021 × .025 in. Nitinol upper archwire was used (Figure 11 (D)) as with an overjet as great as this (Figure 11 (A)), it would be sheer folly to attempt full correction by simple tipping. Initially it was planned to use an anterior hi-pull headgear, to assist the elevation and retraction of the maxillary incisors, but this proved unnecessary. Overjet and overbite were reduced by the use of check elastics throughout treatment. Figure 11 (B) and (D) show the case after one year of treatment, still far from finished, but with dramatic changes. Figure 11 (C) and (E) show the case nearing completion.

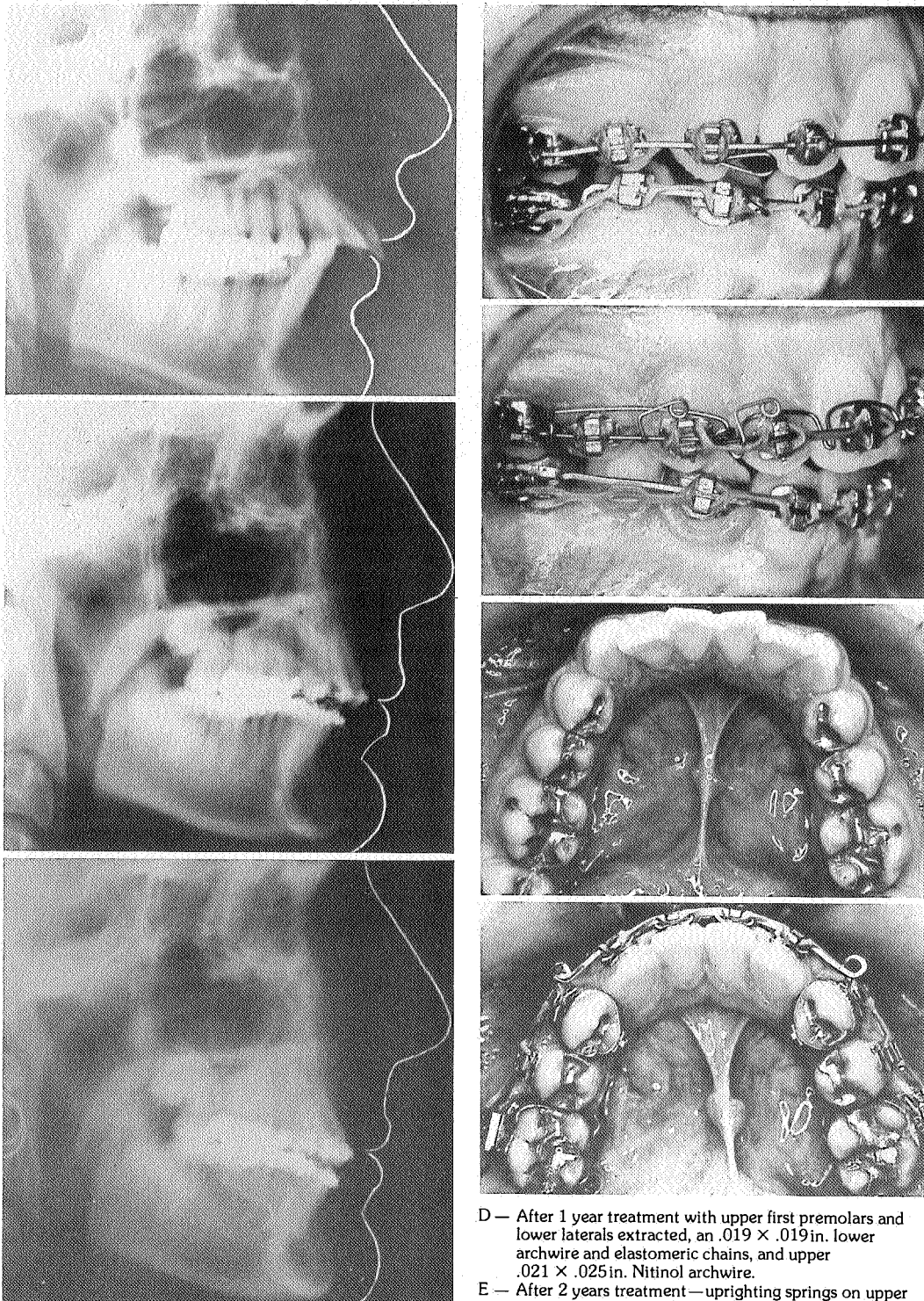


Figure 11 Case 7

- A — Cephalometric radiograph — pre-treatment.
- B — Cephalometric radiograph after 1 year of treatment.
- C — Cephalometric radiograph after 2 years of treatment.

- D — After 1 year treatment with upper first premolars and lower laterals extracted, an .019 X .019in. lower archwire and elastomeric chains, and upper .021 X .025in. Nitinol archwire.
- E — After 2 years treatment —uprighting springs on upper lateral and canine and torquing auxiliary on central incisors and laterals, elastomeric chains 33 and 66.
- F — Lower arch —pre-treatment showing lateral rotations and crowding.
- G — Lower arch near end of treatment.

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Richard A. Hocevar
University of Otago
Department of Orthodontics
Box 647
Dunedin, New Zealand

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Tel.: (08) 295 7598