



# CASE REPORTS

## *Slide*™

low friction system



low friction @

**low cost**



# Thoughts on low friction biomechanics

Gabriele Scommegna, Director of Research and Development, Leone SpA

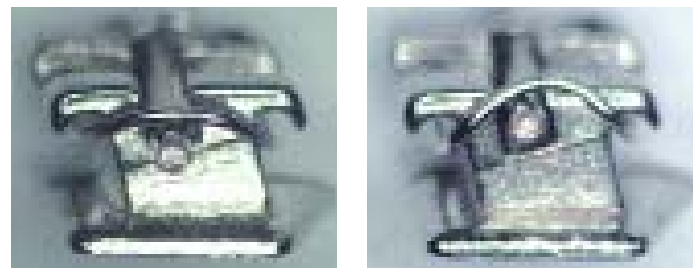
As Head of Research and Development at Leone, my job is to supply orthodontists with the best possible instruments to carry out therapies. From my standpoint, the question of the evolution of Biomechanics in Orthodontic work is a crucial one.

In my researches, with particular regard to the materials that are employed in the orthodontic practice, I am fortunate enough to be able to draw information from a wealth of data (text books, articles, lectures et al.) from the Leone archives.

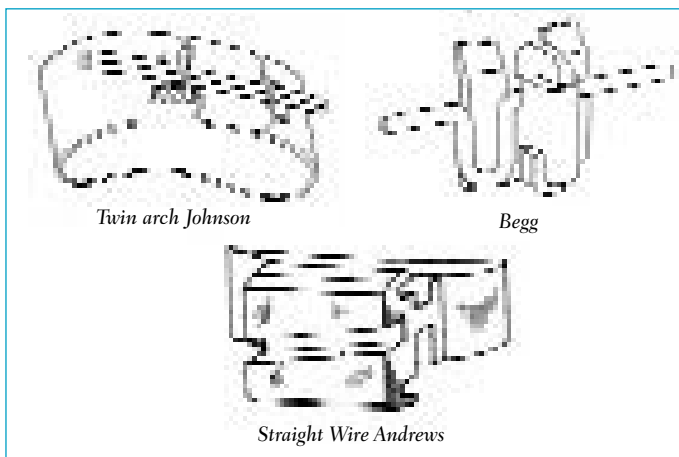
In fixed Orthodontics, the interaction of Slot and Wire generates the forces to promote dental movement. Geometry, wire composition, slot dimensions and shape are all contributing factors in the quest for biomechanical efficiency. In the past, techniques such as Johnson, Begg, Edgewise and Andrews all offered elements of evolution in fixed Orthodontics. The type of ligature used is also of primary importance in this context, as biomechanical action will be greatly influenced by it.



- While metal ties can produce the same effect when applied tightly, they can also be shaped in such a way that will enable the Orthodontist to reduce that compression.



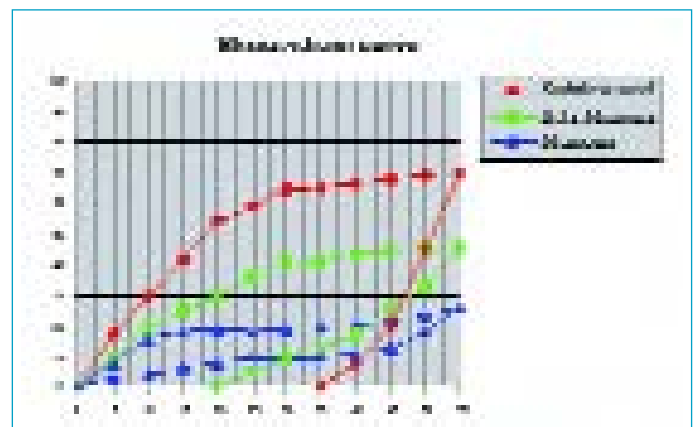
It is therefore possible to generally claim with a certain degree of accuracy that fixed orthodontics have evolved from a low control over dental movement, as with Johnson's technique, to the more sophisticated therapeutic options available today, that allow the practitioner to simultaneously predetermine the three-dimensional position of each tooth in the arch.



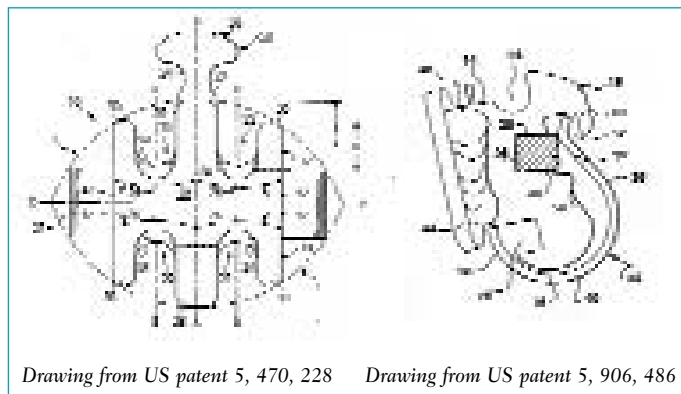
Older techniques used to employ metal ligatures exclusively, as those were the only ones available, while in more recent years elastic ligatures have become more and more popular.

With regard to the locking of the wire inside the slot, we can identify some points of distinction:

- elastic ligatures, by way of their shape and composition, will invariably compress the portion of wire that runs through the slot towards its floor.

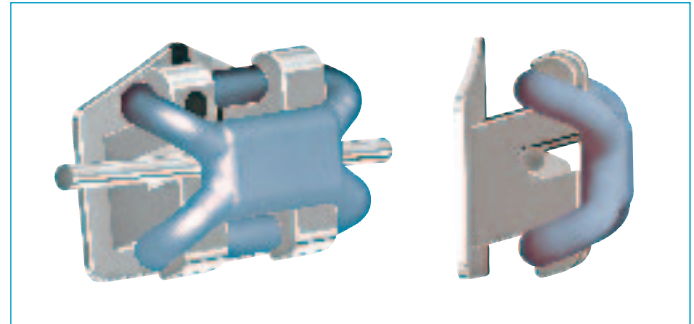


At the same time, some fundamental developments were taking place in the area of the materials used in making orthodontic wires; the final goal here being control over dental movement by means of light, continuous forces (as light, in fact, that they can be measured in just a few tens of grams). Though orthodontists in the modern day have access to very sophisticated brackets and wires to control three-dimensional tooth movement with accuracy, some of the more valid principles found in older techniques were forgotten in this evolutionary rush. We feel some of those principles deserve re-evaluating, albeit within these new contexts. In past times, great importance had been placed on the interaction of wire and slot under tight ligature, while it is now ascertained both experimentally and clinically that friction caused by ligatures slows down the orthodontic action, especially during the alignment and levelling stages. In other words, the biomechanical specifics of modern brackets play an important role towards the central and final stages of treatment, while it can be said that, in the initial stage of therapy, an old-fashioned, low-control type of bracket would be better. To this end, a new generation of brackets, called self-ligating, was developed. Through their special morphology, which features a ligature mechanism with a hinge, these brackets separate the biomechanical concepts in passive, ideal in initial treatment phases and active necessary during subsequent treatment phases.

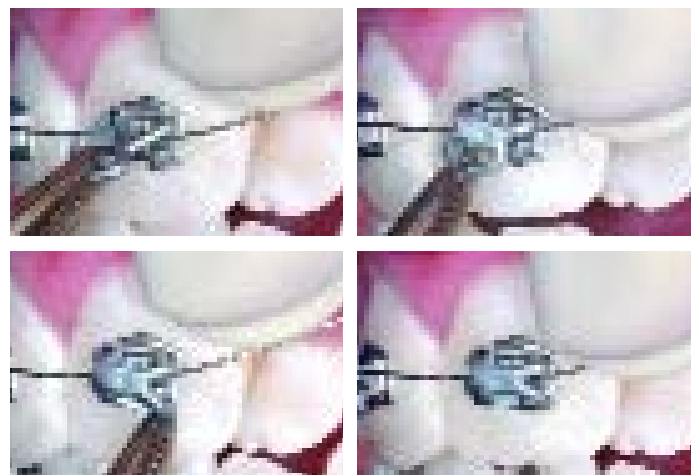


Self-ligating systems, though similar to one another in concept, offer different levels of clinical efficiency on account of their manufacturing and morphology features. My personal perception of these systems is one of some productive difficulty and unease of management inside the dentist's practice, resulting in a disproportionate cost-effect ratio. That is why we decided to point our research efforts towards a new kind of ligature that would be versatile and easy to use while it would also make low friction - and light forces - that would be completely available when required by therapy. That was how the new Leone **Slide™** low friction ligature, the first of its kind to ever be developed, was born. The new ligature, that can be applied to any type of bracket currently on the market, enables the orthodontist to manage friction according to the necessities of the current therapeutic stage. Thanks to **Slide™**, it will be possible to

determine when, where and for how long to apply the forces generated by the wire, so as to promote tooth movement unencumbered by friction, for example only in the upper arch or only in the anterior section.



This versatility allows the practitioner, during the appropriate treatment stages, to fully exploit the peculiar advantages found in no-friction systems, while simultaneously obtain the three-dimensional control normally associated with conventional ligatures. Moreover, this will be possible using virtually any type of bracket available today.



**Slide™** ligatures are a new device -made of a special polyurethane mix for medical use- that is applied in a similar way to traditional O-ring elastic ligatures and that, once in place, creates a passive ligature around the bracket slot leaving the wire free to flow and to work on the dentoalveolar structures. Its peculiar shape considerably improves the patient's comfort during the initial stages of treatment.

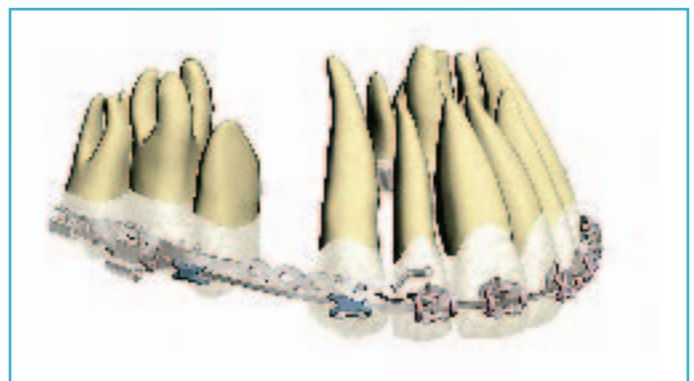
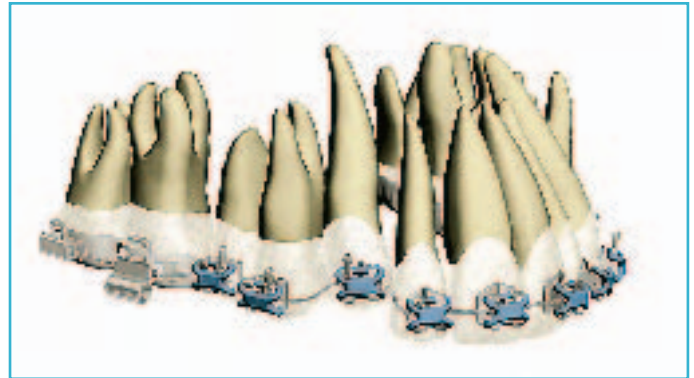


**STEP SYSTEM FEATURING Slide™ LOW FRICTION LIGATURES**

Leone's STEP system is a treatment method derived from our clinical advisors Dr. Arturo Fortini and Dr. Massimo Lupoli's work experience - combined with Leone's outstanding technology. The result is a systematic approach to different malocclusions with the goal of obtaining maximum therapeutic efficiency in the shortest possible time, with complete patient's satisfaction in mind. This system, coupled with the use of the new Slide™ ligatures, offers the opportunity to fully exploit the biomechanical advantages of no-friction systems while reducing treatment times and the need for extractions.

The STEP system, combined with Slide™ ligatures, allows us to:

- fully take advantage of the properties of nickel-titanium **Memoria®** arch wires used in conjunction with the new ligatures, applying light forces with "functional" effect on the dentoalveolar structures.
- Use rectangular arches with conventional ligatures in a determined section of the mouth so as to obtain the best Torque control, easier sliding mechanics and consequential closure of spaces thanks to the employment of Slide™ ligatures in other sections.



\*international patent pending

*In the following section we present some cases treated by our Clinical Advisors Drs. Arturo Fortini and Massimo Lupoli in which the new Slide™ ligatures have been used. As can be seen from the images, levelling and alignment have been achieved very quickly by using a simple and comfortable treatment method.*

*Dr. Fortini and Dr. Lupoli are scientific consultants and official speakers for the Leone Step System. They have given lectures and courses in Italy, United States, Mexico, Spain, Portugal, Czech Republic, and Russia.*

**MD DDS Arturo Fortini**



Degree in Medicine and Surgery at the University of Florence, Italy in 1977. Certificate of specialization in Odontostomatology at the University of Florence, Italy. S.I.D.O. Italian Society of Orthodontics ordinary member. A.A.O. American Association of Orthodontics international member. Fellow of W.F.O. World Federation of Orthodontics. A.A.F.O. American Association of Functional Orthodontists member. E.O.S. European Orthodontic Society member. Certificate of Excellence in Orthodontics (Italian Board of Orthodontics) in 2001. Author of several scientific publications on Orthodontics in

*Italian and foreign journals. Exclusively dedicated to Orthodontics and mostly to Straight-Wire technique following Bennett-McLaughlin philosophy.*

**MD DDS Massimo Lupoli**



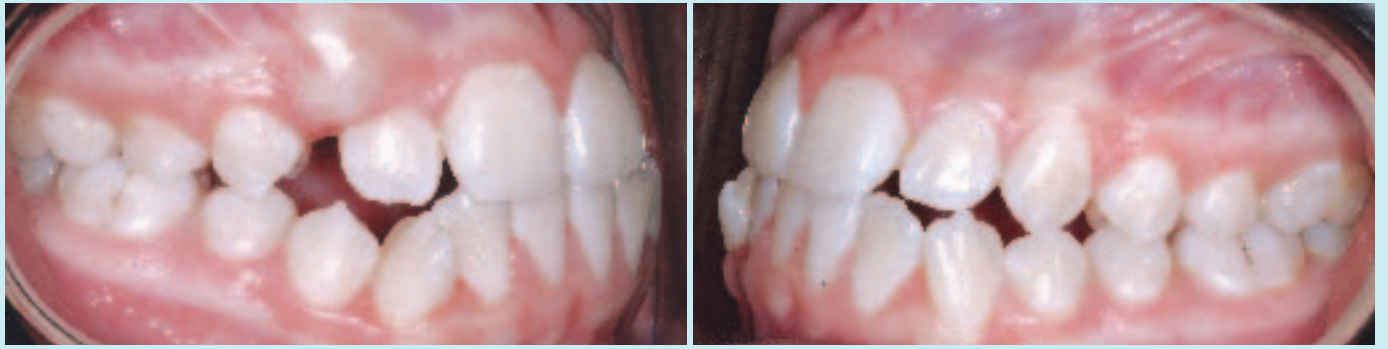
Degree in Medicine and Surgery at the University of Florence, Italy in 1982. Certificate of specialization in Odontostomatology at the University of Florence, Italy. Certificate of specialization in Orthodontics at Sacro Cuore, Catholic University of Rome, Italy. S.I.D.O. Italian Society of Orthodontics ordinary member. A.A.O. American Association of Orthodontics international member. Fellow of W.F.O. World Federation of Orthodontics. A.A.F.O. American Association of Functional Orthodontists member. E.O.S. European Orthodontics Society member. Lecturer to

*the updating course on Functional Orthodontics at the University of Dentistry in Helsinki – Finland. Post-graduate certificate at the New York University School of Dentistry, Orthodontic Dept.- U.S.A. Certificate of Excellence in Orthodontics (Italian Board of Orthodontics) in 2003. Certificate Mount Sinai Hospital in Detroit – U.S.A., Pre-surgery Orthodontic Division. Lecturer at the University of Bari – Italy for the year 1993-94 in the course of degree on Odontology and Prosthesis for four seminars in orthodontics.*

## CASE 1

**PATIENT: F.S., FEMALE, 13.7**

Skeletal and Dental Class III. Treatment plan features bracketing only in the upper arch to suit the patient's aesthetic concerns (see position of 13). Scheduled extraction of 14 and 24. Treatment of the lower arch will occur in pre-surgery decompensation upon reaching the ideal age.



Upper arch: Straight Wire Mechanics. Gold Tone steel .016" arch. Lace-back on left canine, no bend-backs.



Change of therapeutic plan, from extraction of 14 and 15 to low friction mechanics through *Slide*™ ligatures. Brackets also on first bicuspids. .014" **Memoria**® nickel-titanium super elastic arch wire. No lace or bend-backs.



After 7 weeks the canine is almost completely aligned, lots of space has been reclaimed (see starting picture). Good over bite control and improved midline.



After 10 weeks the canine is aligned and arch shape has gained harmony.



Occlusal view at start and after 10 weeks.

## CASE 2

### PATIENT: M. M., FEMALE, AGE 31

Patient requested orthodontic treatment on aesthetic concerns.

Serious crowding in the upper arch with 13 and 23 completely vestibular.

Very deep skeletal and dental bite with considerable retro inclination of the central and lateral upper incisors.

Lower incisors are lingually inclined and retro positioned.

Treatment plan includes decompensation of the upper incisal inclination through sliding biomechanics but, because of the severity of the crowding in the upper arch, extraction of the first bicuspid has also been scheduled.

Accurate monitoring of changes in the overbite is therefore necessary, as this can be negatively influenced by the planned extractions.

Mechanical space regaining for 35 and 45 and correction of the inclination of the canines are planned for the lower arch.



**START OF TREATMENT - 24 MAY, 2004**

Extraction of 14 and 24. Straight Wire STEP System mechanics.

Start of low friction mechanics with **Slide™** ligatures and a .014" **Memoria®** nickel-titanium super elastic arch wire. No lace or bend-backs. No other device for posterior anchorage control.



**28 JULY, 2004**

Continuing low friction mechanics with **Slide™** ligatures. .016" **Memoria®** nickel-titanium super elastic wire.

Considerable improvement of the positions of the canines and arch levelling. The canines are almost aligned with some post-extraction space still available. Deep bite and incisors inclination also visibly improved.





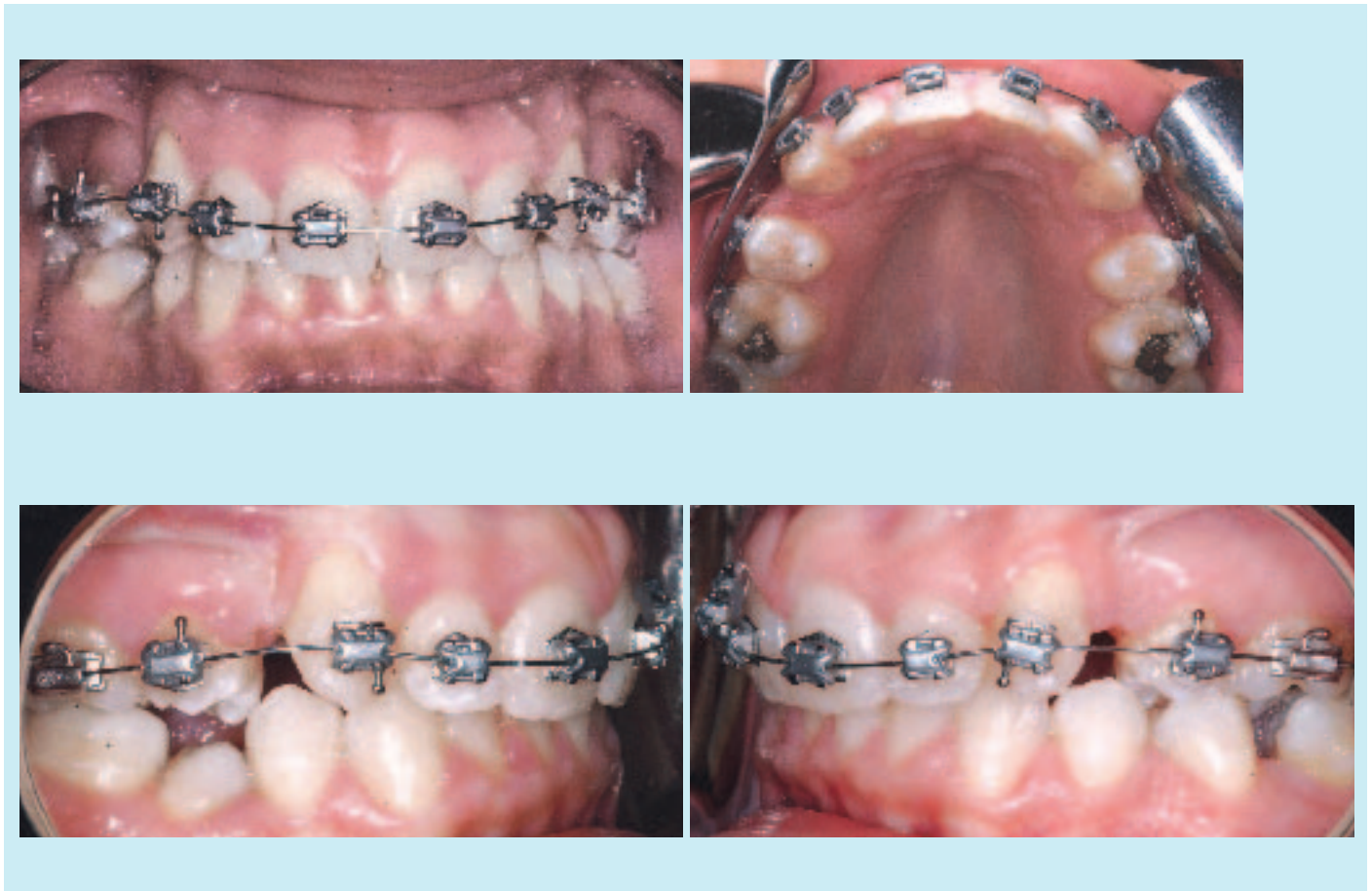
**1 SEPTEMBER, 2004**

Arch wire is now .016" Australian Gold Tone Steel.

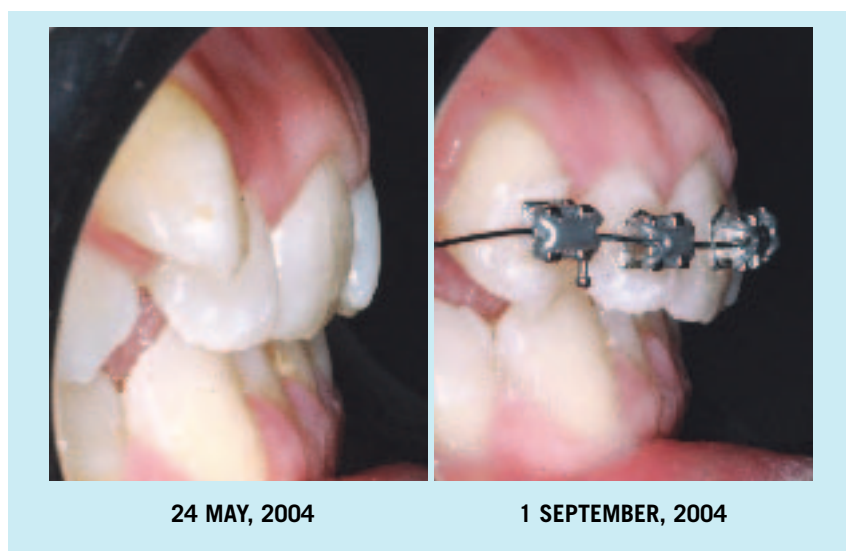
Alignment and levelling phases almost completed.

No noticeable opening of the bite in the lateral sections with almost half of the post-extraction space still available.

This confirms our successful choice of no friction, easy sliding mechanics.



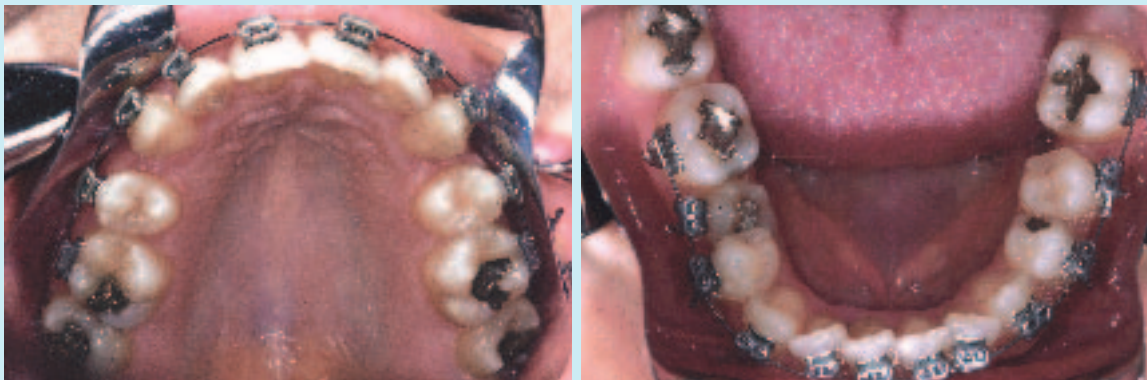
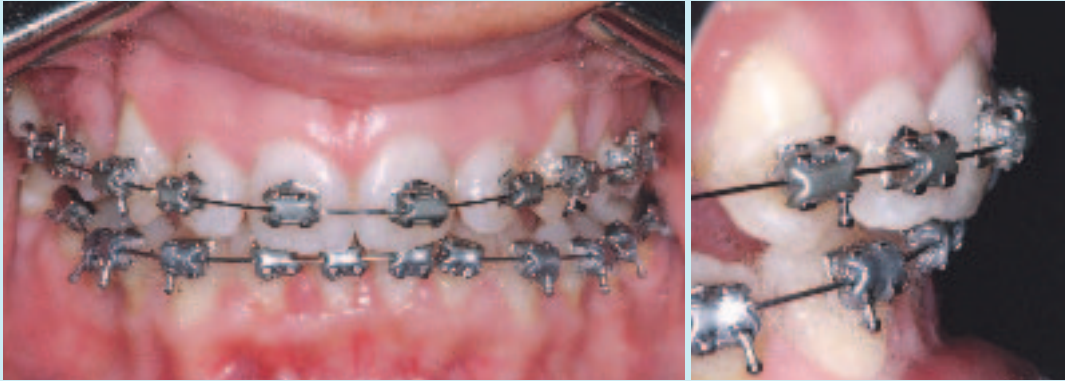
Bite is progressively opening and incisor inclination is improving.



3 NOVEMBER, 2004

Bracketing of the lower arch.

STEP brackets with low friction *Slide*™ ligatures and .014" **Memoria**® nickel-titanium super elastic wire.



12 JANUARY, 2005

Upper arch: end of alignment and levelling phase.

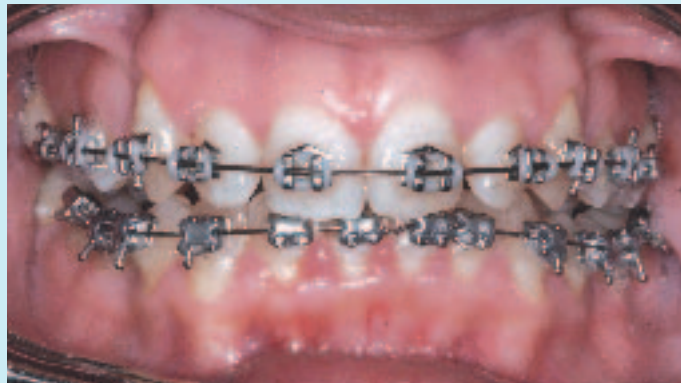
- Arch is now a .020" Australian Gold Tone.

- Ligatures are now conventional O-ring elastic ones, as low friction is no longer needed.

- The next wires we will use are stainless steel during torque and space closure phases. We will also be able to apply controlled friction by using *Slide*™ or conventional metal or elastic ligatures in different sections of the arch.

Lower arch: continuing the alignment and levelling phase with .016" **Memoria**® nickel-titanium arch wire and *Slide*™ ligatures.

- Note the considerable amount of space regained in area 45.



## CASE 3

**PATIENT: I. V., FEMALE, AGE 23**

Class II 2<sup>nd</sup> Division.

Patient presented serious deep bite, skeletal and dental, with considerable retro inclination of the upper central incisors; this had caused a severe retro positioned mandible with TMJ problems and pain.

Our treatment plan featured an immediate correction of the mandibular position by means of a rapid treatment of the upper incisors' inclination.

Subsequent re-shaping of the upper arch was scheduled and, as soon as possible, bracketing of the lower arch in order to re-gain enough space towards the insertion of prosthesis for the 35 and 45, genetically missing.

Distal uprighting of the lower sixes and sevens was also planned.

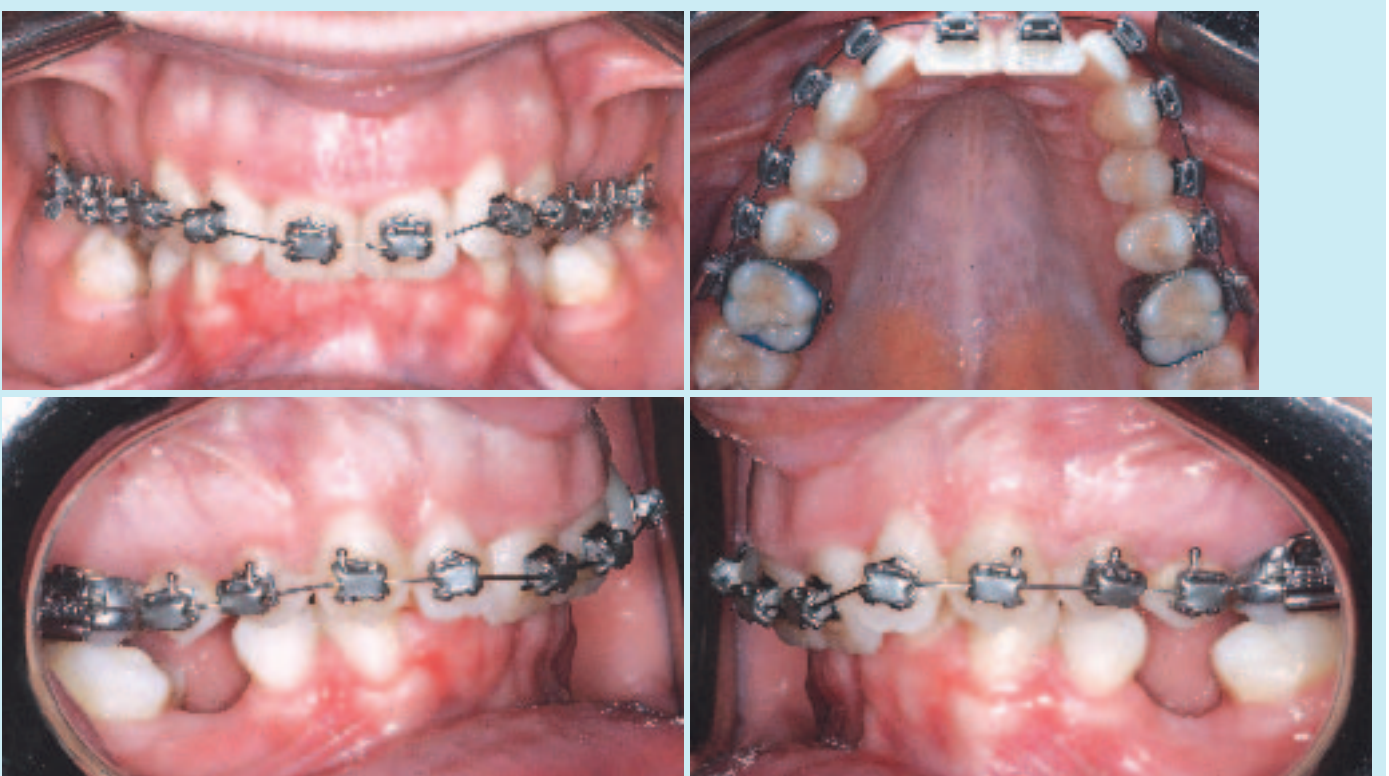


**4 NOVEMBER, 2004 - START OF TREATMENT**

STEP Straight Wire mechanics. Start with low friction mechanics using Leone *Slide*™ ligatures. .014" **Memoria**® nickel-titanium super elastic arch wire. No lace or bend-backs.

**14 DECEMBER, 2004**

Continuing low friction mechanics with *Slide*™ ligatures. Improved arch shape and upper incisors' inclination.

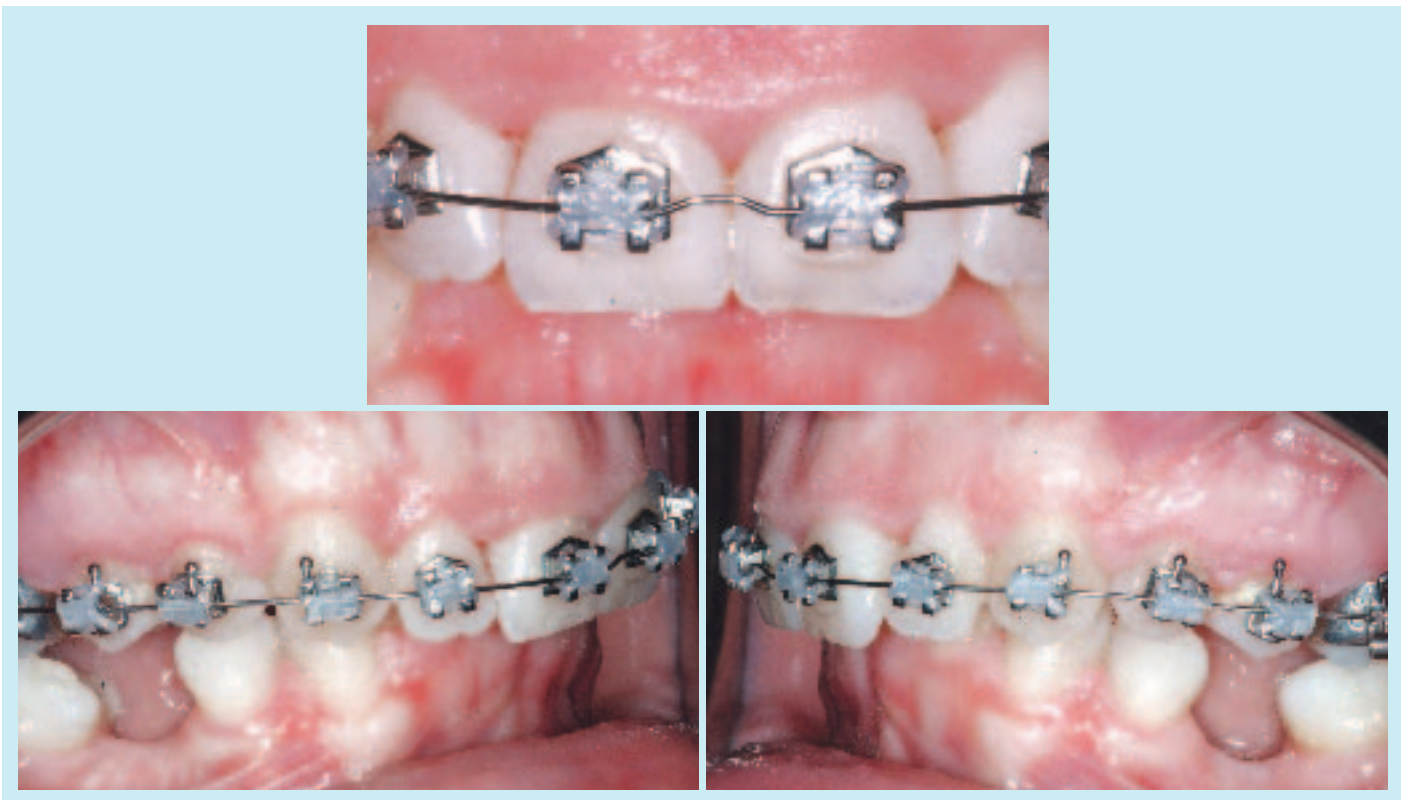


**18 JANUARY, 2005**

The second arch wire used for levelling is a .016" **Memoria®** nickel-titanium super elastic one. No lace-backs or bend-backs. Excellent re-shaping of the arch has been achieved, with levelling and alignment almost completed. A correct inclination of the upper incisors has also been achieved, with enough overjet to allow bracketing of the lower arch without any contacts.



Visual effect of the new **Slide™** ligatures (ice colour) on STEP stainless steel brackets.



**23 FEBRUARY, 2005**

Alignment and levelling phases towards completion.  
.016" stainless steel Australian Gold Tone arch wire.



Initial overjet and upper incisors' inclination compared.



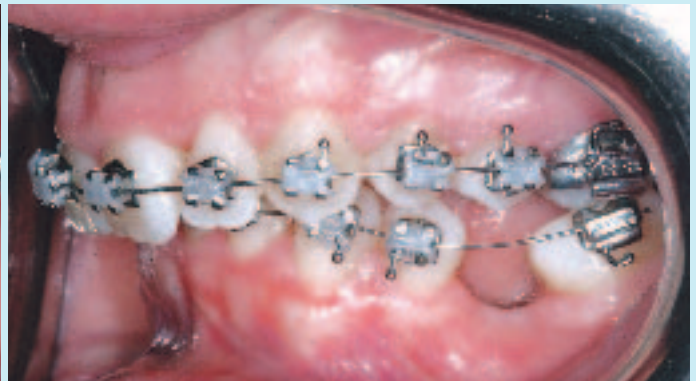
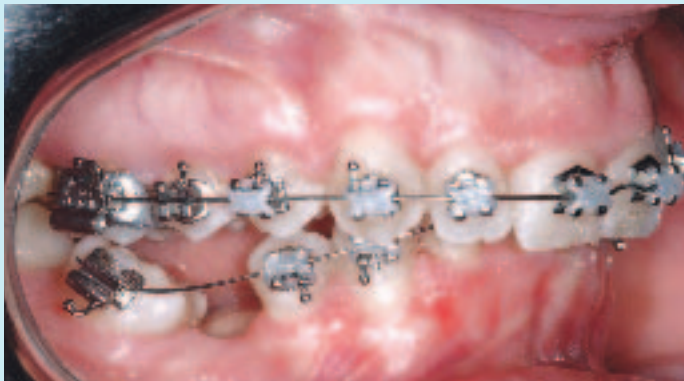
**4 NOVEMBER, 2004**



**23 FEBRUARY, 2005**

1 MARCH, 2005

Bracketing in the lower arch. STEP System mechanics with *Slide™* low friction ligatures in place. .014" **Memoria®** nickel-titanium super elastic arch wire. No lace-backs or bend-backs.



I.P.



## Orthodontics and Implantology

Leone S.p.a. - Via P. a Quaracchi, 50 - 50019 Sesto Fiorentino - Firenze - Italy  
Phone +39 055.30.44.620 - Fax +39 055.30.44.05 e-mail: info@leone.it

[www.leone.it](http://www.leone.it)