The aim of this paper was to determine the torque resistance of this new implant during placement in different types of bone, immediate placement into sockets, and in grafted bone. The torque at time of placement serves as an indication of initial stability, which is accepted as an important factor for implant osseointegration and immediate loading. Within a 13-month period, 140 NobelActive implants in 84 consecutive patients were placed into types I–IV bone in fresh sockets, and into grafted bone (both in maxillary sinuses and on the facial alveolar surfaces where bone had been lost). The final torque was measured with a manual torque control wrench as manufactured by Nobel Biocare for clinical use with this type of implant. One hundred forty implants with 3.5 to 5 mm diameters and 10 to 15 mm lengths were placed in different types of bone, either as delayed or immediate implants into fresh extraction sockets. These implants demonstrated a mean torque stability value of 50.8 Ncm. The average insertion torque for delayed implants was 49.7 Ncm. For immediate implants the average torque was 52.6 Ncm. Placement into soft bone was also favorable at an average of 47.9 Ncm. Typical straight walled and tapered implants generally exhibit 10 to 35 Ncm insertion torques. The NobelActive implant consistently reaches higher torque levels. This may indicate they are more favorably suited to early provisionalization and loading. Soft bone (type IV) did not seem to decrease significantly the torque of insertion of these implants. Further longer term studies are needed to investigate whether this indeed makes these implants more suited for early provisionalization and loading than traditional root form. Long term studies are also needed to investigate maintenance of bone levels surrounding these implants.

Key Words: dental implant, immediate implant, torque, primary stability, NobelActive implant

**INTRODUCTION**

Implants are now accepted as one of the principal treatment options in cases where a tooth (or teeth) is missing or needs to be extracted. The literature presents us with numerous studies supporting their predictably high success rates regardless of brand and design.¹⁻⁴ One of the main focuses of any recent implant-related professional meeting is the concept of immediate placement and/or immediate loading of...
implants. Another focus of these meetings is peri-
implant soft tissue management, which is dependent
on osseous crest preservation around fixtures.

Traditional straight walled or tapered implants
whose osteotomy sites have been drilled too close to
the diameter of the implant tend to have decreased
torque resistance when placed in bone with poor
density. To overcome this lack of torque resistance,
osteotome techniques have been developed to com-
press the bone laterally rather than remove it with a
drill. In this paper we review the theory and rationale,
along with the advantages and disadvantages of a new
type of implant designed to create greater compression
of bone without inducing pressure necrosis. This, in
theory, should allow for earlier provisionalization of the
implants. The torque resistance of 140 consecutively
placed implants of this new design in delayed, immediate,
and bone-grafted sites is reported.

**Methods to increase primary stability**

Implant success rates have been consistently shown to
be influenced by the quality and quantity of bone
available.1,4–9 Although quantity of bone is certainly
important, it seems that bone grafting techniques to
increase the width and height of bone have been
successful in leading to placement of implants that
post similar survival rates to those placed in naturally
healed bone. In addition, short implants have also
been shown to exhibit impressive success rates10–12 in
apico-coronally compromised sites (eg, posterior
regions) when careful treatment planning criteria are
followed.13 These success rates resemble those of
"standard" or "long" implants but are not yet equal.

The quality of bone seems to play an even more
important role in implant success. Lekholm and Zarb14
first described 4 types of bone quality that are still
readily used to describe bone quality in contemporary
papers, namely type I–IV, where type I is the most
dense and type IV is the poorest quality. The anterior
mandible, which typically has type I bone, has been
shown to lead to the best insertion torque values and
implant stability and thus to the highest success rates.
In the posterior maxilla, where the bone quality is
typically type III or type IV, achieving good primary
stability with high insertion torque values is not
predictable, and the success rates cannot compare
with those of the anterior mandible. Numerous studies
support this association between quality of bone and
long-term success rates.15–22 In more recent years,
implant design advances and surface modification have
led to higher success rates in all bone types.23,24

However, type I bone still shows more predictable long-
term success rates when compared with type IV.25,26

Methods to increase primary stability have been
documented in different papers. Self-tapping implants
negate the need for a tapping/threading drill and may
improve implant stability and survival rates.27–29 Wider
implant diameters have also been suggested to
improve surface contact area, decrease bone crestal
stress, and perhaps improve primary stability.30
Another method used is to underprepare the osteot-
omy sites for implants.31 This means that the final
normal drill of any given system would not be used,
and thus the implant would be placed in a "smaller"
than usual hole. In poor bone quality areas, these
compressive forces between the implant and the
mismatched (diameter wise) osteotomy site could lead
to enhanced primary stability. However, this technique
requires significant clinician experience to be able to
assess the compression forces generated on the jaw
bone by the implant being placed. Too much compression
could lead to cell death and necrosis.32

Another method to increase primary implant
stability is to condense laterally the osteotomy site
with osteotomes instead of using the drills, a method
first introduced by Summers.33

One of the most interesting properties of the new
NobelActive implant is the ability to laterally condense
(as occurs with an osteotome procedure) the bone as
it is being inserted into the alveolar process of the jaw.
This feature alone would allow this particular implant
system to achieve on a consistent basis higher than
average torque values. There are numerous studies
indicating that high primary stability is associated
with very high success rates.19,34–38

**Study design**

In this prospective study, we analyzed some of the
preliminary results from the first 140 consecutively
placed NobelActive implants in 84 patients in 2 private
practices by 2 experienced clinicians. The average age
of our patient pool was 48.4 years. Out of 84 patients, only 7
were current smokers (8.3%), while no patients exhibited
diabetes or any serious medical condition. The implants
were placed in all 4 types of bone in all areas in the
mouth with or without simultaneous bone grafting.

The insertion torque was measured carefully and
documented for all cases using the NobelActive hand
wrench instrument from the NobelActive Surgery Kit,
which can measure torque values up to 70 Ncm (Figure 1).
The quality of bone (type I–IV) was also
documented during placement and was based on the
experience of the 2 clinicians as the literature
indicates.39 The literature has shown that it is very
difficult to correctly differentiate between type II and
type III bone with subjective assessment criteria. It is
possible though to predictably and consistently
discriminated among extreme bone qualities (type I
and type IV)\textsuperscript{40} in order to determine which implants
are placed in very soft type IV bone. These results were
then correlated to the torque values at time of
placement. Therefore, the authors chose to categorize
their bone types in this study into 3 distinct categories
that they can subjectively determine in a consistent
manner, ie, dense (type I), medium (type II–III), and
soft (type IV).

**RESULTS**

From January 2008 to January 2009, the 2 authors
placed 140 NobelActive implants in 84 patients in their
2 private practices. Implant sizes (Figures 2 through 4),
bone density types, and patterns of socket healing are
compared to initial implant stability in Figure 5. The
results from our study show an insertion torque
average from 44 Ncm on the 3.5-mm diameter
implants to 56.2 Ncm on the 4.3-mm implants to
50.9 Ncm on the 5.0-mm implants. Although the
dense bone quality exhibited the highest torque
placement with 61.6 Ncm, there was still a high mean
torque of placement shown in the soft and medium
density bone (types I–III) at 47.9 Ncm. Very little
difference was noted between placement of implants
in healed sockets and fresh extraction sockets, ie, 49.7
Ncm vs 52.6 Ncm (Table 1).

The torques achieved in the implants placed in the
various mandibular sites were evidently higher than

**Figures 2-4.** Figure 2. This is a narrow platform NobelActive implant with dimensions 3.5 × 13 mm, used most commonly in narrower clinical situations such as the upper laterals and lower incisors. Figure 3. This is a regular platform NobelActive implant with dimensions 4.3 × 13 mm that can be used in almost any situation with the appropriate treatment plan. Figure 4. The regular platform implants in this system come in 2 different body widths, ie, 4.3 mm and 5.0 mm, without the actual prosthetic platform changing. This is a regular platform NobelActive implant with dimensions 5.0 × 10 mm. Therefore, the actual prosthetic components for this particular implant would fit in the one depicted in Figure 3 as well.

The manual torque wrench for the NobelActive system by Nobel Biocare is gold in color (in contrast to the silver one for its other implant systems) and allows controlled torque as measured up to 70 Ncm.
those placed in the maxillary sites, ie, 60 Ncm vs 47.5 Ncm. There were more failures noted in the mandible, but the number of implants that failed was too low to draw any conclusions, and further observation and investigation is needed (Table 2).

Out of 140 implants placed in 84 consecutive patients, the initial torque was less than 30 Ncm in 18 cases, while on the remaining 122 sites, the implants were placed with torque values ranging between 30 and 70 Ncm (Table 3). All of the implants placed in the mandible (100%) achieved at least 30 Ncm of insertion torque, whereas only 82.5% of those in the maxilla reached this level, indicating perhaps a better response in the lower jaw.

**DISCUSSION**

Rabel et al investigated 602 implants from 2 different implant systems—a non−self tapping system (408 implants) vs a self-tapping implant system (194 implants)—and found the average insertion torque to be 28.8 Ncm and 25.9 Ncm, respectively. Higher torque values have been achieved by some studies with experienced clinicians where the torque values were consistently over 30 Ncm. When comparing TiUnite straight platform implants in nearly 300 subjects, Alsaadi et al discovered favorable primary implant stability in type I and II bone averaging close to 30 Ncm. These values dropped as the bone quality decreased. In another recent study with rough surface parallel walled implants, it was shown that insertion torque could exceed even 55 Ncm in the anterior mandible but would drop dramatically to under 11 Ncm in the posterior maxilla.

It has also been suggested that when immediate loading is intended, implant torque should exceed 30 Ncm. In our study, we predictably achieved a torque of 30 Ncm or higher in 122 out of 140 implants (87.1% of all cases). When breaking down the data even further, it was discovered that all implants that were placed with less than 30 Ncm were placed in the maxilla, while the mandibular implants were placed with at least 30 Ncm in every single case.

In this investigation, several interesting points arose. Both investigators aimed for torques under or near the 70 Ncm mark since the new design of the NobelActive implants allows it without fear of damaging the internal hex prosthetic connection. However, little is known as to what such forces may do to the surrounding crestal bone, and some risk may be involved when attempting to impose such high torque values on the crestal bone, especially in type I bone or very thin bone. Perhaps a lower stress (in terms of final torque of placement) on the bone during final implant placement is more desirable.

This has led the 2 authors to a new focus for their next study, where they are now comparing the crestal...
bone maintenance around NobelActive implants as it relates to initial torque placement, bone density, and jaw site. Their aim of this upcoming article is to establish the safest possible margin of initial torque placement with the NobelActive system, so the initial promising results remain consistent throughout healing. This could lead to predictably aiming for improved primary stability almost every time we place an implant, decreasing significantly any chance of implant micromotion, and promoting even higher success rates in immediate implant placement and immediate loading.

CONCLUSION

Immediate implant placement and especially immediate loading of implants has been receiving increasing attention during the last several years in implant dentistry. The NobelActive system seems to develop predictable and consistently high torque during initial implant placement. This property of this new implant could prove to be beneficial for significantly increasing the number of cases that can be immediately loaded in our practices.

REFERENCES


