Clinical Evaluation of the NobelActive Implant System: A Case Series of 107 Consecutively Placed Implants and a Review of the Implant Features

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The purpose of this paper is to (1) introduce the features of this new implant, (2) investigate the clinical benefits as advertised by the manufacturer in comparison with traditional root form implants, and (3) provide guidelines for its use. One hundred seven NobelActive implants were placed in 67 consecutive patients with type I–IV bone within 8 months. Cases also include implants placed in sinus grafts, ridges with insufficient thickness and facial bone loss and were placed with delayed and immediate loading. Parameters were assessed to determine whether we could confirm the manufacturer’s statements on this implant system. Results obtained with 107 implants of 3.5, 4.3, and 5 mm diameters with 10- to 15-mm lengths placed in different types of bone with delayed and immediate loading demonstrated a final insertion torque from 15 to 70 Ncm. All types of bone allowed “redirection” of the implant but were limited in the bone with higher density. According to the manufacturer, this new design of the NobelActive implant has high initial stability, bone condensing properties, redirecting capability, built-in platform shifting, and dual-function prosthetic connections. After investigating these 5 statements within the limits of our study, we were able to confirm these claims, but with some recommendations for the clinical use and placement of these implants.

Key Words: dental implant, corkscrew design, initial torque stability, NobelActive, immediate loading

Introduction

The success rate for osseointegration of dental implants has been shown to be very high for many different designs and brands of implants.1–6 Of particular interest now for the advancement of dental implants is the ability of implants to withstand early or immediate loading to reduce the waiting time for the patient to have a functional dentition. Also of considerable interest is the configuration of the implants that promote long-term preservation of the bone around the implant and thus contribute to
esthetic success with preservation of the overlying soft tissues and papillae.

The authors’ experiences after placing 107 consecutive NobelActive implants are shared in this document and are used to evaluate the advertised properties of this new design in delayed, immediate, and bone-grafted sites.

Overview of the NobelActive implant system

The Nobel Biocare Company has made the following statements regarding NobelActive implants on its website (http://www1.nobelbiocare.com/en/implant-solutions/products/nobelactive/nobelactive.aspx):

- This system is recommended for experienced users.
- NobelActive provides high initial stability, even in compromised situations.
- NobelActive exhibits a bone-condensing property.
- NobelActive exhibits a redirecting capability for optimal placement.
- NobelActive is designed with a built-in platform-shifting concept.
- Dual-function prosthetic connection. (This restorative statement is not discussed because it is beyond the scope of this paper.)

Study design

The authors have initiated a long-term prospective study on NobelActive implants. The preliminary results from the first 107 consecutively placed implants in 2 private practices by 2 experienced clinicians have been analyzed. The implants were placed in all 4 types of bone and in all areas in the mouth with or without simultaneous bone grafting. The manufacturer’s advertised statements were assessed whenever possible. The insertion torque was measured and documented for all cases using the NobelActive hand wrench instrument from the NobelActive surgery kit. This manual torque wrench has the ability to measure insertion torque up to 70 Ncm. The quality of bone (type I–IV) was also documented during placement and was based on the extensive experience of the 2 clinicians. It was difficult to differentiate between type II and type III bone, but it was straightforward to determine the implants placed in very soft type IV bone or very dense type I bone. Type IV bone was of particular interest because this is where low insertion torques are normally encountered. Only 2 early failures occurred (average length of time since placement of implants in this investigation is 9.25 months with range from 5–13 months; Table 1).

RESULTS

The manufacture’s statements regarding the NobelActive implant system were assessed.

Statement: “NobelActive provides high initial stability, even in compromised situations”

The Nobel Biocare Company designed the “NobelActive” implant to improve implant performance in poor quality bone and in sites where there is limited bone quantity (Figure 1). The design was intended to lead to higher insertion torque and better primary stability, thus potentially making this implant more effective for immediate placement in fresh extraction sockets for simultaneous placement with sinus augmentation procedures, for placement in poor quality bone, and for immediate loading.

Insertion torques in different bone types are listed in Table 2. An average insertion torque of 51.4 Ncm was achieved for the delayed implants. For immediate implants in fresh extraction sockets, the average torque was 52.9 Ncm. In type IV (soft) bone, the NobelActive implants exhibited an average insertion torque of 49.7 Ncm when most implant studies would

<table>
<thead>
<tr>
<th>Implant Width</th>
<th>Number of Implants</th>
<th>Average Time Since Placement (months)</th>
<th>Early Implant Failures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Narrow platform 3.5-mm diameter</td>
<td>31</td>
<td>8.5</td>
<td>1</td>
</tr>
<tr>
<td>Regular platform 4.3-mm diameter</td>
<td>57</td>
<td>9.5</td>
<td>0</td>
</tr>
<tr>
<td>Wide platform 5.0-mm diameter</td>
<td>19</td>
<td>10</td>
<td>1</td>
</tr>
</tbody>
</table>

*Of 107 implants that were in place for an average of 9.25 months, 105 proceeded to the restorative phase with only 2 early failures.

Figure 1. The new NobelActive design exhibits accentuated threads/wings and narrower core compared to other systems.
Another method used is to under-prepare implants. This means that they may be 20%–25% smaller in diameter than the actual size of the implant. The NobelActive self-tapping implant allows placement with minimal osteotomy (the last drill used can be 1–3 sizes smaller). The high pitch (i.e., large distance between threads) and long wings (distance of thread edge from implant body) promote fast insertion with simultaneous horizontal bone condensation. The condensation is gradual and is experienced during insertion. One of the unique features of the NobelActive is that during reverse movement, the fractures “break” the trabeculae. Thus, this implant mostly “condenses” when being placed and “cuts” when reversed. This allows the implant to “release” the stress that builds up during placement by minimal reversing action.

In this study, the authors were able to predictably place this implant in osteotomies that were consistently 20%–25% smaller in diameter than the actual size of the implant. In fresh extraction sockets and poor type bone quality, there were cases in which the osteotomy was less than 50% of the final width of the implant placed.

Statement: “NobelActive exhibits a bone condensing property”

Various 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. Another method used is to under-prepare the osteotomy sites for implants. 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 osteotomy site. 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 jawbone by the implant being placed. Too much compression could lead to cell death and pressure necrosis or even fracture of the bone. The NobelActive self-tapping implant allows placement with minimal osteotomy (the last drill used can be 1–3 sizes smaller). The high pitch (i.e., large distance between threads) and long wings (distance of thread edge from implant body) promote fast insertion with simultaneous horizontal bone condensation. The condensation is gradual and is experienced during insertion. One of the unique features of the NobelActive is that during reverse movement, the fractures “break” the trabeculae. Thus, this implant mostly “condenses” when being placed and “cuts” when reversed. This allows the implant to “release” the stress that builds up during placement by minimal reversing action.

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Statement: “NobelActive exhibits a redirecting capability for optimal placement”

The majority of implant systems promote a “passive” placement, which means that once the osteotomy site has been drilled, the implant cannot be changed in its buccolingual or mesiodistal direction. There can be little “correction” if the initial drilling was not accurate. This could potentially lead to compromised esthetic results or abandoning a procedure in order to repeat it in the future under better circumstances. The most unique claim of the NobelActive implant is its ability to “change direction” during placement to allow clinicians to “correct” positioning in cases where they are not satisfied with the final placement of the implant. If true, this feature would provide clinicians with an advantage to adjust the position during placement. However, if the original osteotomy is ideally prepared, then this feature could add some risk since the implant could be inserted in an incorrect angulation outside of the osteotomy site. It would require a certain level of experience from the clinician in order to avoid losing “control” during the insertion of the implant by preventing close contact with an adjacent tooth or having inappropriate angulations of the implant.

The authors used this feature commonly in nonmolar sites. Using the straight surgical driver (manual implant insertion driver), they were able to carefully assert changes in all directions, occasionally even correcting the positioning of the implant 2 and 3 times without any apparent detrimental effects on its initial stability. On the other hand, the capability of redirecting the implant could work against the operator with the use of the surgical hand-piece or a manual torque wrench to place this implant in the posterior zone. Using the insertion instrument that has a lever arm like the manual torque wrench and the handpiece to a degree as opposed to the “straight manual screwdriver” encountered a problem of redirecting the implant unintentionally from the original ideally placed osteotomy.

Statement: “NobelActive is designed with a built-in platform-shifting concept”

The head of the implant is designed to allow, “platform shifting” and to remove the “micro-gap” from the edges of the implant head, thus promoting stability and maintenance of the crestal bone levels.

<table>
<thead>
<tr>
<th>Number of Implants</th>
<th>Torque at Time of Placement (Ncm)</th>
<th>Early Implant Failures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total implants</td>
<td>107</td>
<td>51.9</td>
</tr>
<tr>
<td>Delayed implants</td>
<td>70</td>
<td>51.4</td>
</tr>
<tr>
<td>Immediate implants</td>
<td>37</td>
<td>52.9</td>
</tr>
</tbody>
</table>

Table 2: The insertion torque achieved at the time of placement with NobelActive was similar regardless of the implant placement in a healed ridge or in a fresh extraction socket.
(Figures 2 and 3). For example, the regular platform implant has a body diameter of 4.3 mm at its widest point, but the head of the implant reverts to 3.9 mm. The wide platform fixture has a diameter of 5.0 mm at its widest point, but the head of the fixture reverts to 3.9 mm (Figure 4).

There can be an advantage to the “platform shifting” design of this implant when placing it in the esthetic zone. It is well known that the distance from the crestal bone to the contact point between adjacent crowns has a major impact on the ability to maintain the soft tissue papilla between them.\(^{15}\) The horizontal distance between adjacent implants seems to have an equally important impact on papilla maintenance.\(^{16,17}\) Platform shifting could be an advantage in the upper anterior region since it could lead to increased bone preservation interproximally between 2 adjacent implants or between an implant and a tooth, thus increasing the chances of maintaining the soft tissue papillae. Indeed, it seemed that during placement the crestal bone maintained between adjacent implants or between an implant and an adjacent tooth was improved when using these implants in the otherwise “tight” anterior spaces. This effect can, of course, also be accomplished with a traditional root form implant if a narrower body size is used.

In the posterior zone, although the mesiodistal space was available for a molar size implant, this platform-switching feature seemed to backfire. This feature “forced” the emergence profile of molars to start from a “narrower” than usual platform of 3.9 mm, when prosthetically it would seem advantageous to

![Figure 2](image2.png)
**Figure 2.** The platform-switching concept “shifts” the micro-gap from the bone crest onto the coronal implant surface away from the crest.

![Figure 3](image3.png)
**Figure 3.** Evident platform shifting on peri-apical radiograph.

![Figure 4](image4.png)
**Figure 4.** The wide platform fixture has a diameter of 5.0 mm (at its widest point), but the head of the fixture reverts to 3.9 mm.
have a 5-mm platform (or even wider in many cases) for an appropriate molar emergence profile crown. Of course, when the mesiodistal space was “compromised,” this feature could still offer an advantage even in molar sites.

**Statement: “NobelActive is recommended for experienced users”**

Both authors are experienced clinicians in surgical implant dentistry and yet went through a significant “learning curve” while placing these implants. They experienced “mishaps” that were clearly due to “being new” at using this design. Even after placing several implants, experience was still the strongest asset of the investigators in utilizing this system to its full potential and avoiding or at least reducing the occurrence of problems. Problems encountered due to inexperience with this new system included (1) under- and over-drilling the osteotomy site, (2) allowing the implant to inadvertently be redirected out of the osteotomy site when using a hand torque wrench in the posterior, and (3) placing the implant in too thin a ridge by relying on bone expansion alone.

**DISCUSSION**

The NobelActive implant has some innovations that make it useful in certain clinical situations.

Insertion torque of placement is critical for implant success and survivability. Several clinical studies have investigated the insertion torques of various implant systems. When investigating 761 Ti-Unite Branemark MK-III implants placed in nearly 300 patients, Alsaadi et al found that the average torque of insertion was about 30 Ncm for type I and II bone, while it dropped to 22 Ncm in type III bone and to 17 Ncm in type IV bone when following the recommended protocol from the manufacturing implant company. In other studies, the average insertion torque was between 10 and 30 Ncm. When placing Straumann and Astra Tech implants, Akca et al found that the average insertion torque values reached were as high as 57.58 Ncm and 68.53 Ncm, respectively, for the anterior mandible with typically type I dense cortical bone. However, these values would drop to an average of 10.72 Ncm and 6.35 Ncm, respectively, in the posterior maxilla where you would typically have type IV soft bone. The NobelActive implant in this early investigation has consistently shown above average insertion torque values in all types of bone quality with an average insertion torque of 52 Ncm. Primary stability is a very important prognostic marker for implant success. The greater the primary stability the less likely to experience micro-motions between the implant and the surrounding osseous alveolar walls. This is conducive to osseointegration and uninhibited osseous healing. The design of this implant allows it to be torqued with forces up to 70 Ncm without fear of damaging the internal hex connection. Both authors/clinicians, when possible, aimed for placement of the implants under 70 Ncm or near 70 Ncm torque. The average torque calculations presented include the initial cases that were treated while the clinicians were on the initial learning curve and developing the ideal insertion torques improved as experience increased.

In our investigation, even in the cases where the NobelActive implant was placed immediately into fresh extraction sockets (where initial stability is generally compromised), the average final torque of insertion was 52.9 Ncm. In molar sites, where the bone quality tends to be type III or type IV, the average insertion torque was 58.8 Ncm.

However, as we gained more experience with this system and evaluated the results, it was felt that there was some risk involved when attempting to reach such high torque values. In dense bone or in very thin bone, the risk of fracture should be taken into consideration. Experience from such situations led the investigators to eventually aim more frequently for torque values between 45 and 60 Ncm. There seemed to be less visible stress on the bone with such a protocol. It was also found that reversing the implant during insertion when the insertion torque was becoming too high helped to decrease the insertion torque in small amounts. When the insertion torque was becoming too high before the implant was fully seated, particularly in type I bone, it was found to be better to remove the implant and enlarge the osteotomy site with a larger diameter drill than to rely on the reverse cutting feature on the implant.

**CONCLUSIONS**

From our experience with this system, we came to certain conclusions/guidelines for using the NobelActive implant.

- NobelActive indeed seems to exhibit the properties that the manufacturer claims.
- The authors found a particular advantage using these implants in fresh extraction sockets of non-molar teeth with resulting very high initial stability.
- This implant system seems to be advantageous in thin ridges, thus minimizing the amount of bone grafting needed or eliminating it all together in some
cases. There are, of course, limits where if the bone width is too thin the cortical bone will slough, and grafting before or during implant placement is still required.

- There was a consistent high initial torque in all qualities of bone, which could potentially allow a higher number of cases to proceed with immediate loading.
- The platform-shifting concept was advantageous in the esthetic zone, but in the molar zone it seemed to be counterproductive in terms of favorable molar emergence profile. A wider head of the implant is desired for molars, so early on in the study our use of this implant became mostly limited to anterior and bicuspids teeth.
- The high primary stability was useful when placing this implant simultaneously during sinus lifts (with lateral window technique), but it presented an elevated risk of bone stress/fracture.
- The authors found the NobelActive implants a useful adjunct to improve and expand treatment options for patients, but it does not replace the need for the traditionally shaped tapered and straight-walled implant systems.

REFERENCES