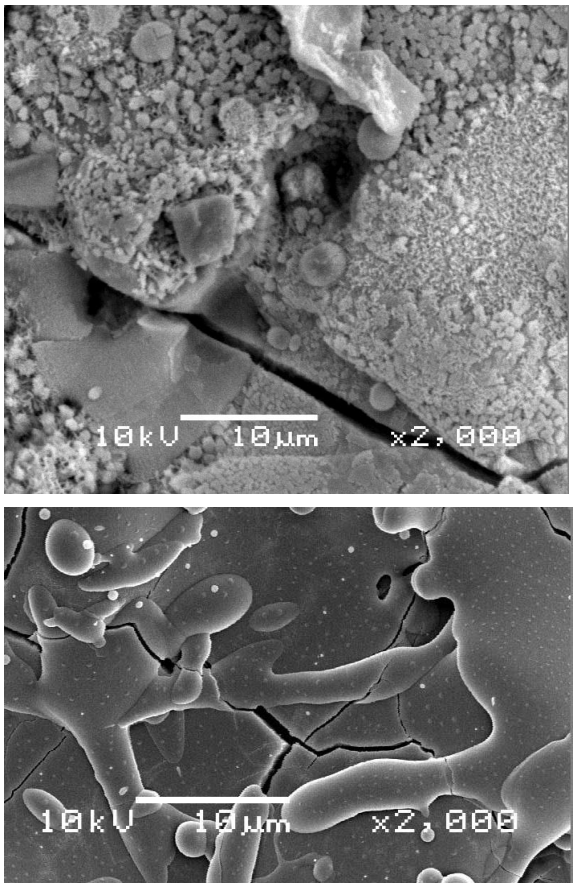
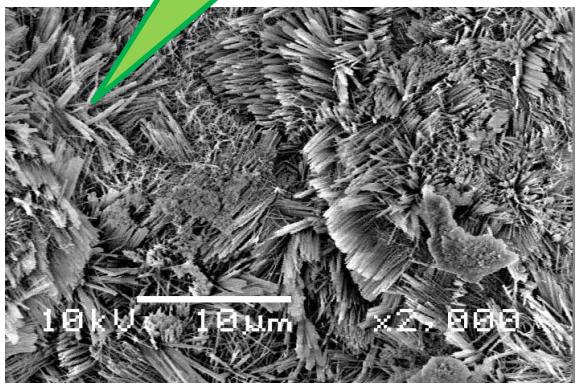
The mechanism by which AQB implant becomes your own tooth

Crystal growth of recrystallized hydroxyapatite (HA) occurs in an ordered unidirectional manner, taking up acicular hexagonal cylinder form. This creates a suitable state of epitaxy whereby the collagen fibers align itself with the HA crystals.



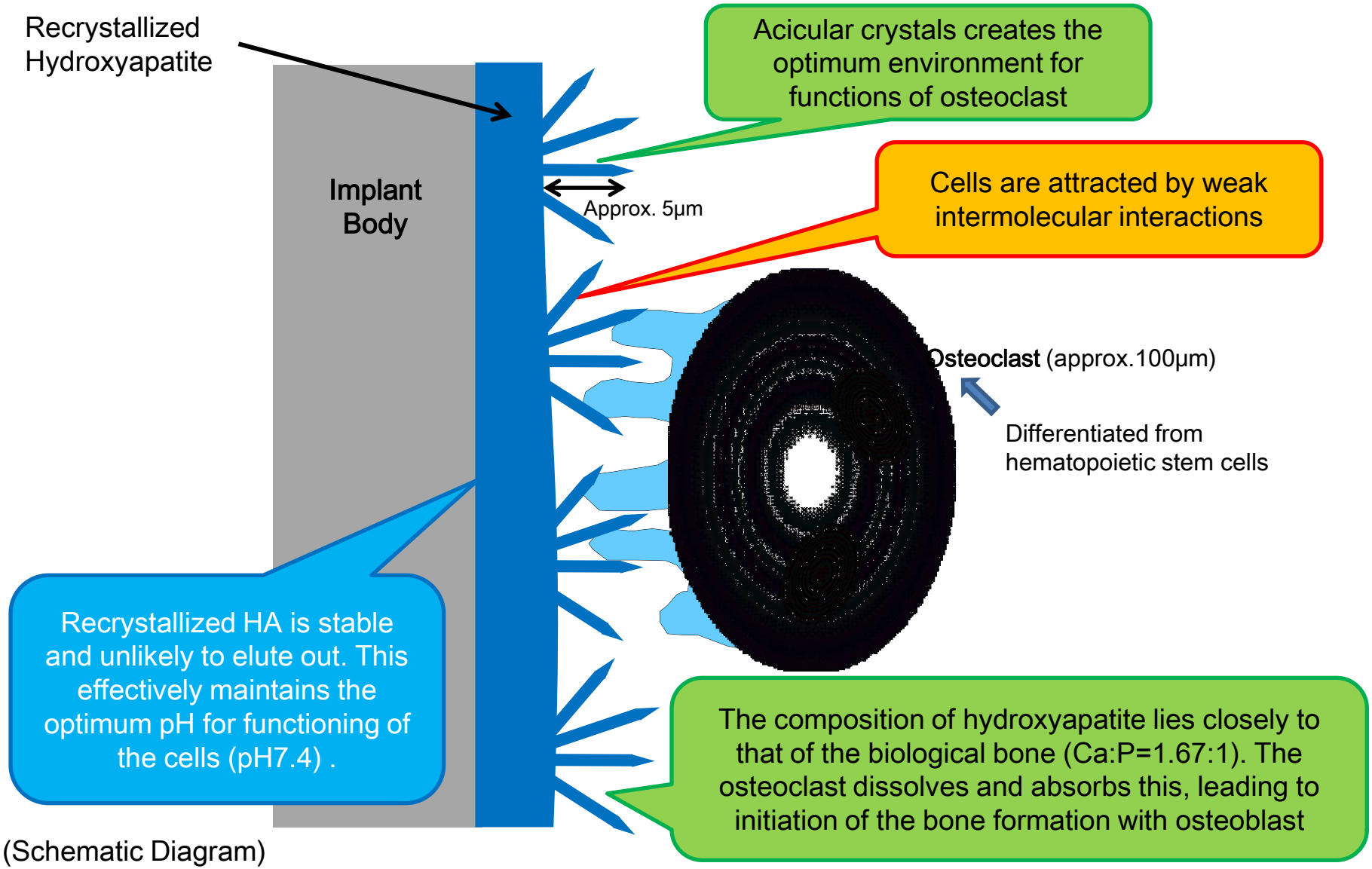
Regular hydroxyapatite coating
(SEM Image)

Acicular hydroxyapatite
Microcrystals are created
with patented technology



Recrystallized hydroxyapatite coating
(SEM Image)

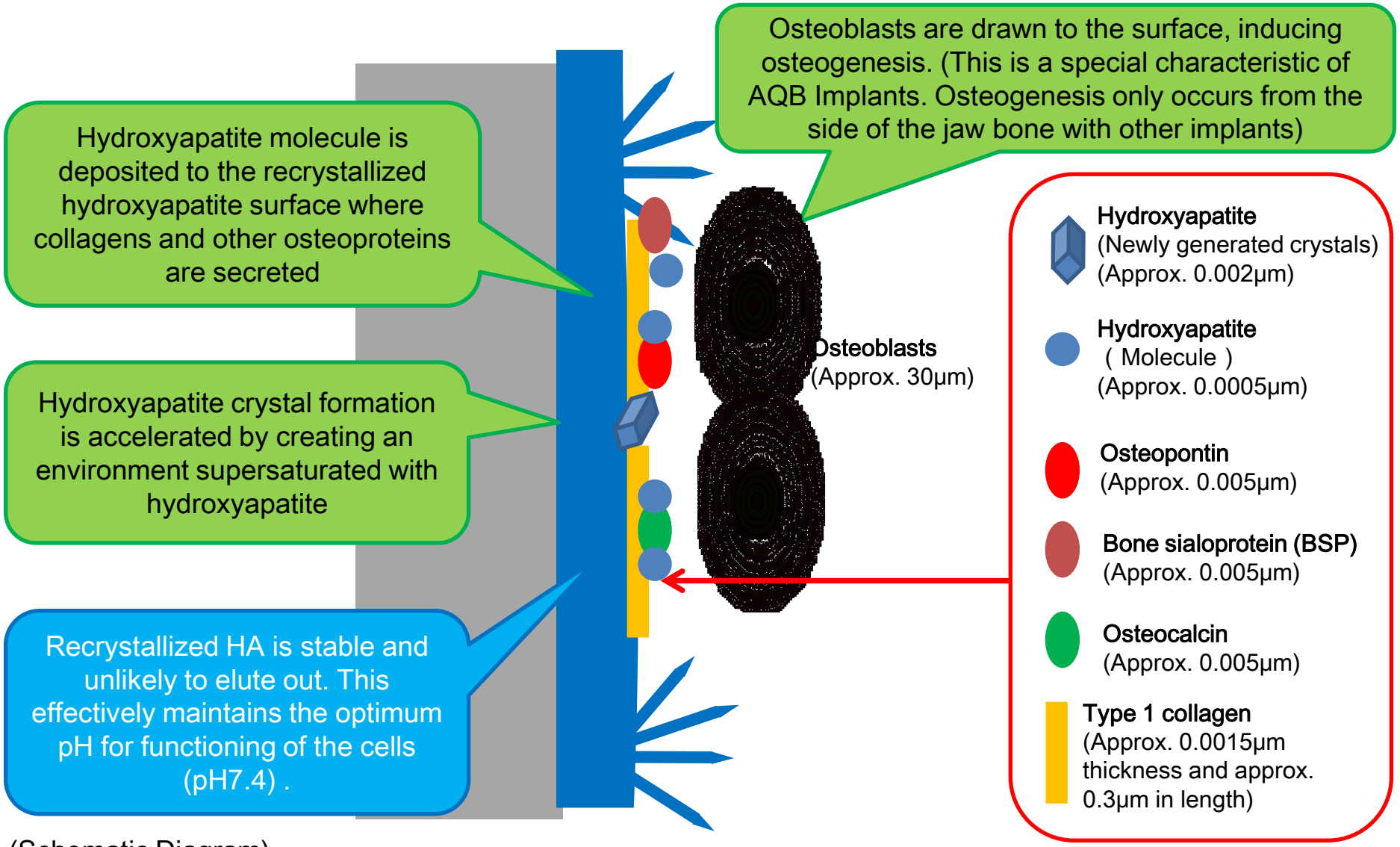
① The microcrystals located on the acicular tips of the recrystallized hydroxyapatite are solubilized by the acid and oxygen species secreted by the osteoclast and are absorbed into it (Osteoclasts can only dissolve and absorb the microcrystals)



(Schematic Diagram)

② New bone generation is induced by the accumulation of osteoblasts to the hydroxyapatite surface solubilized and absorbed by osteoblasts.

Hydroxyapatite are deposited to the collagen produced by osteoblasts. Osteoblasts also have a role in secreting osteoproteins such as osteopontin, osteocalcin, and bone sialoprotein.



(Schematic Diagram)

③ AQB implant becomes integrated as one's tooth by the generation of bone from both implant side and the jaw bone

Recrystallized HA

Hydroxyapatite
(Newly generated crystals)
(Approx. 0.002μm)

Hydroxyapatite
(Molecule)
(Approx. 0.0005μm)

Osteopontin
(Approx. 0.005μm)

Bone sialoprotein (BSP)
(Approx. 0.005μm)

Osteocalcin
(Approx. 0.005μm)

Type 1 collagen
(Approx. 0.0015μm thickness and approx. 0.3μm in length)

Implant Body

Jaw Bone

Bonds chemically with the bone

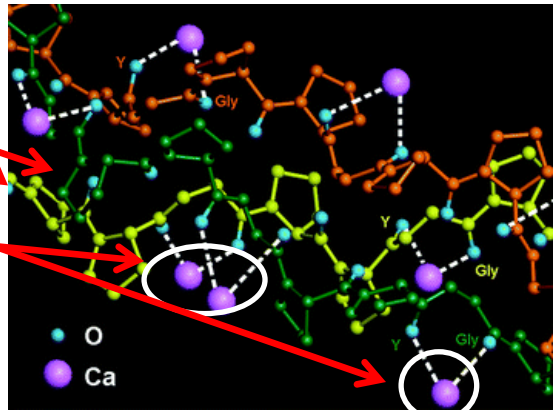
Generation of neonatal bone from the implant side

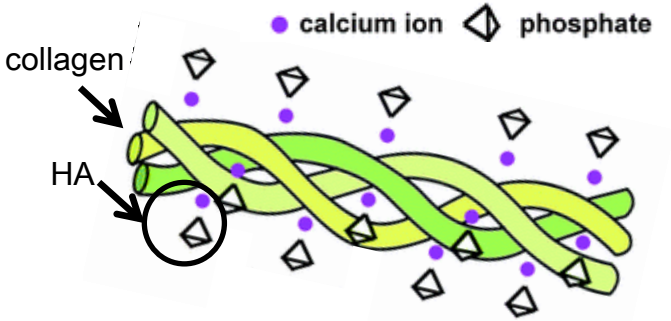
Integration

Generation of neonatal bone from the side of jaw bone

(Schematic Diagram)

Chemical interaction between hydroxyapatite and collagen

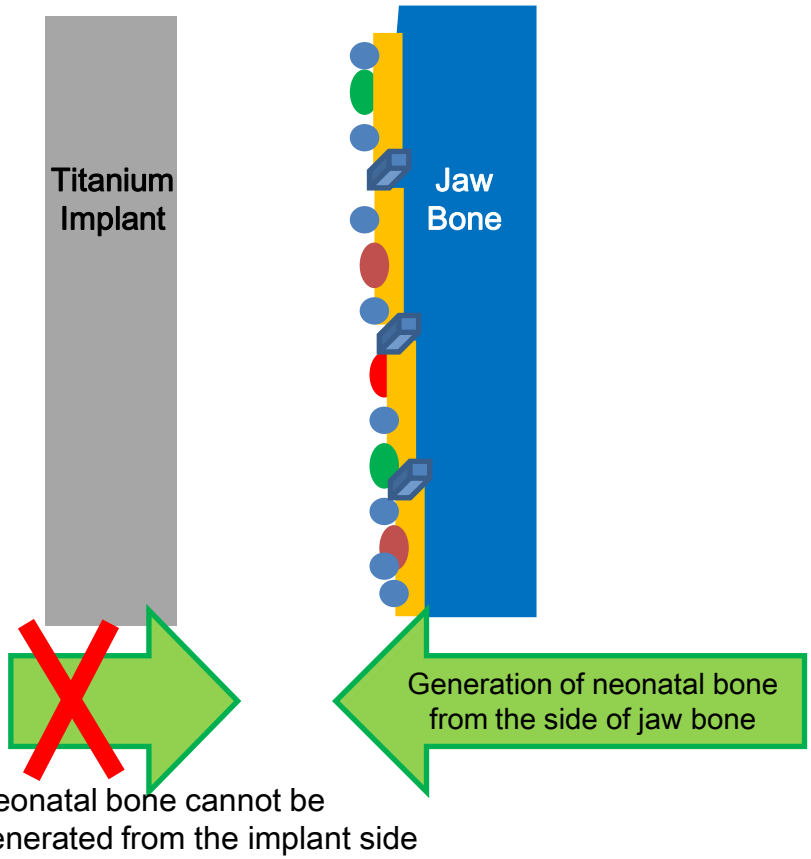




Titanium remains as a foreign object to the body, and it cannot be integrated.

Standard titanium implant
Foreign implant

(Schematic Diagram)

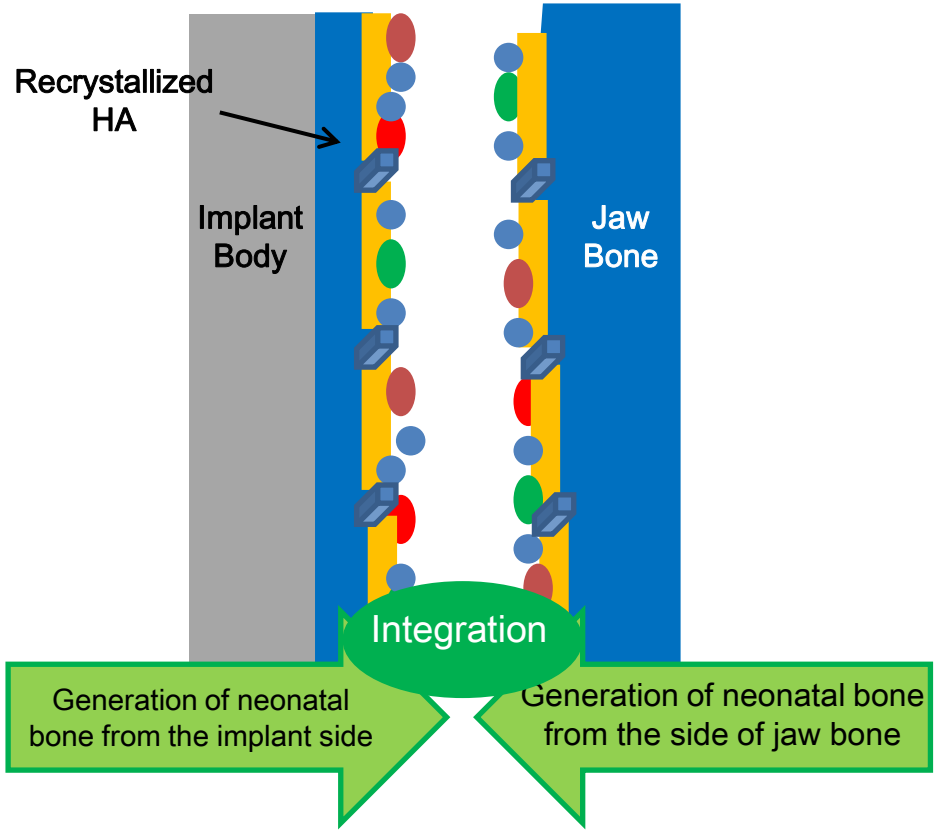


1. Titanium is not bioactive, therefore neonatal bone cannot be generated from side of the implant.

2. The titanium implant can physically bind with the jaw bone, but chemical bonding cannot be formed.

3. Titanium surface is prone to biological aging.
   Ogawa T., Quintessence DENTAL Implantology
   Ogawa T., The Quintessence. Vol. 28 No. 7 / 2009-1487
   Ogawa T., The Quintessence. Vol. 28 No. 9 / 2009-1927

AQB Implant
Living Implant
(Coated with recrystallized HA)



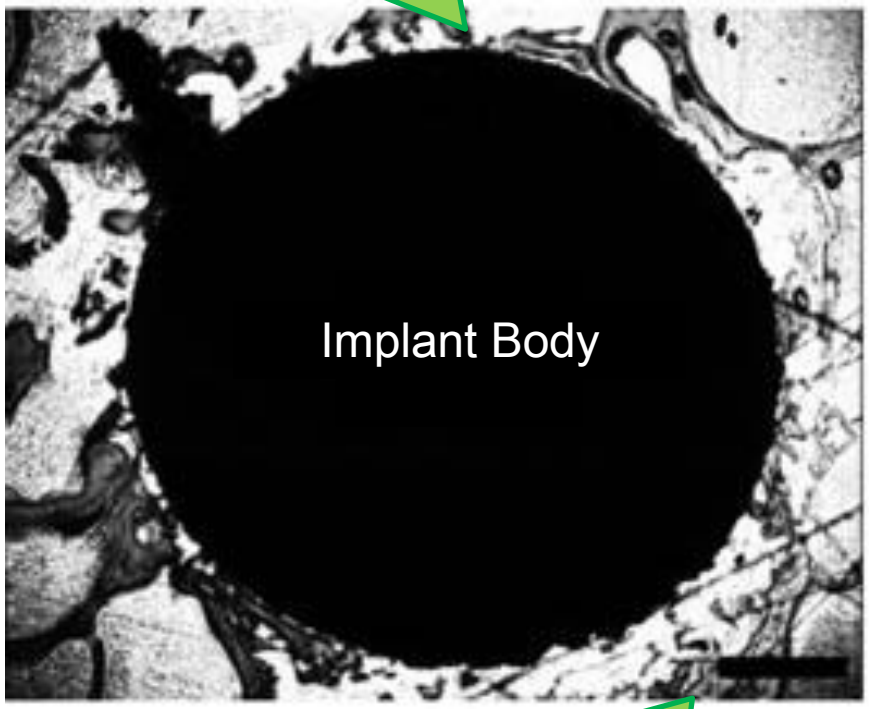
1. Neonatal bone is generated from both the implant side and the side of the jaw bone.

2. The generated neonatal bone from the two sides chemically bind to each other with hydrogen bonding.

3. Recrystallized hydroxyapatite is thought to be integrated with the body via hydrogen bonding.

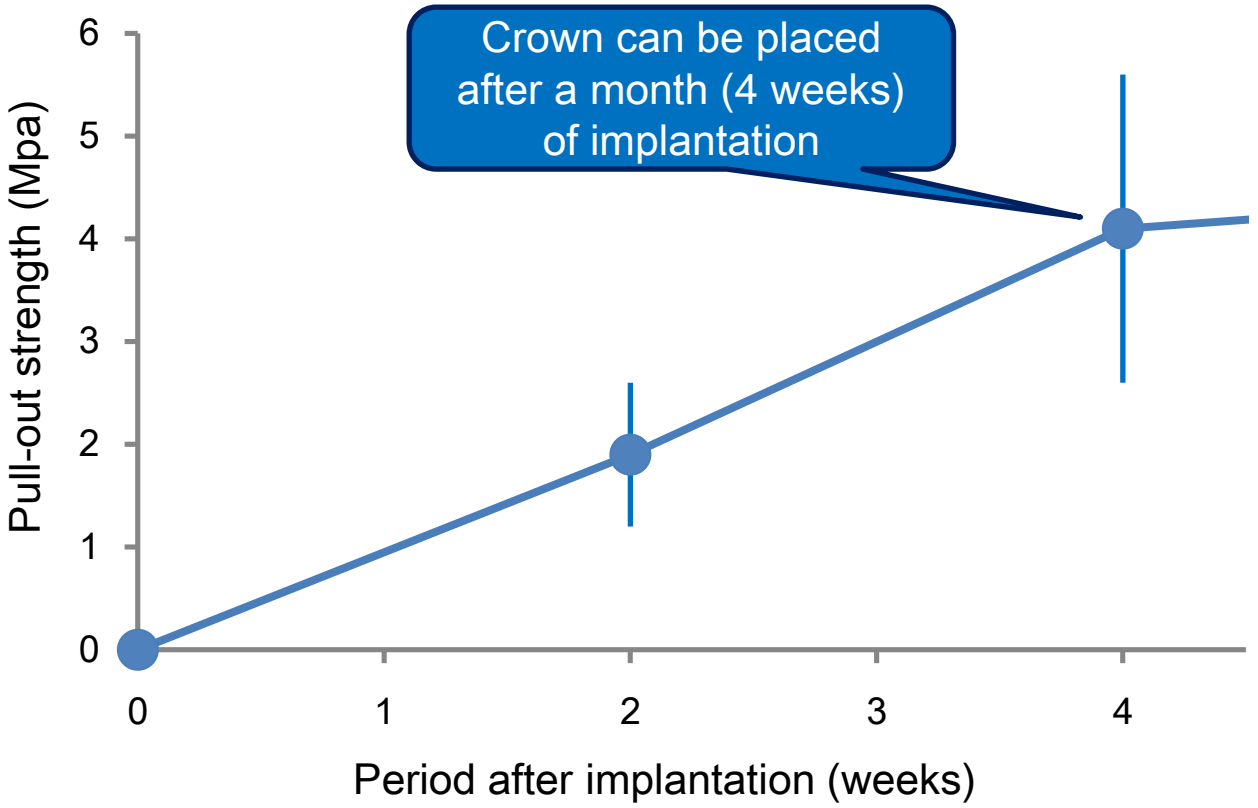
Histological image of the tissues surrounding the implant body (A week after the insertion)

The bone proteins that are induced in turn attract the osteoblasts, forming a thin layer of neonatal bone. This becomes incorporated with the existing jaw bone.



Neonatal bone grows from the existing bone towards the implant body.

The relationship between period of AQB implantation and the pull-out strength

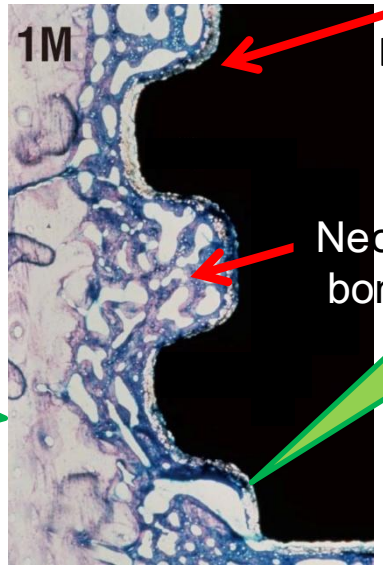


The increased pull-out strength indicates a stronger chemical interaction. The chemical interaction between the AQB implant and the body involves hydrogen bonding.
Above data shows the process of AQB Implant integrating into the body, becoming one's own tooth.

The histological finding of AQB Implant surface after insertion (A month after implantation)

Conformation of AQB screw

Jaw Bone



Implant Body

Neonatal bone

Neonatal bone is generated from the jaw bone towards the implant body.

A thin layer of neonatal bone is created by osteoblasts induced, which is attracted by the presence of bone proteins. This layer grows towards the jaw bone.

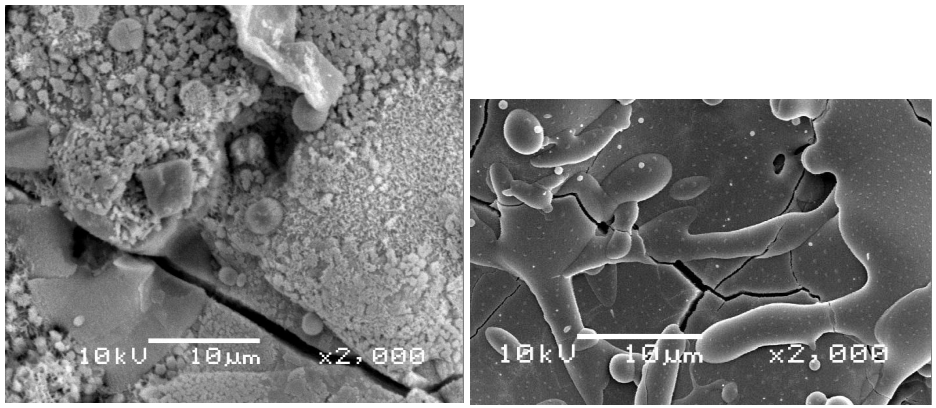
The implant body becomes integrated with the body chemically and biologically after a month (1M)
⇒ Ready for crown placement

Schematic diagram showing the portion of the neonatal bone:

Neonatal bone from the side of the jaw bone

Neonatal bone from the implant side

Standard HA coating (SEM Image)

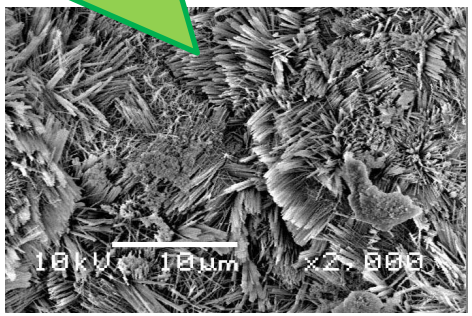


1. Acicular microcrystals is absent
2. Hexagonal microcrystals is absent
3. Not disposed to electrical interaction
4. Cannot attract cells
5. Not an ideal environment for osteoclast functions: solubilization and absorption
6. Rarely induce bone proteins or osteoblasts
7. Cannot be integrated into the jaw bone

Does not play an active role in bone formation

Recrystallized HA coating (SEM Image)

Acicular, hexagonal hydroxyapatite microcrystals are produced



1. Acicular microcrsyals are present
2. Hexagonal microcrystals are present
3. Can form weak covalent bonding
4. Can act as a scaffold for cells
5. Provides an ideal environment for osteoclast activity: solubilization and absorption
6. Actively induce bone proteins and osteoclasts
7. Integrates with the jaw bone

Plays an active role in bone formation