

## Tooth-in-Eye: A Consanguineous Relation

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### Abstract

“The window of the soul is our eye and the window of the eye is cornea”. Extremely less is known in the field of ophthalmology about the role of periodontium. The patients suffering from end-stage corneal blindness, who are not advised for penetrating keratoplasty, the treatment of choice in such condition is Osteo-Odonto KeratoProsthesis (OOKP). This prosthesis has a autologous tooth root-alveolar bone lamina complex and graft of buccal mucosa to hold the plastic optical cylinder which will further help in the light to pass through. In this article we will be learning about Osteo-Odonto KeratoProsthesis (OOKP) in detail.

### 1. Introduction:

The gift of the vision is the best that you can give to humanity. Eyes are the foremost features of our face to be noted, also an important sensory organ.<sup>1</sup> Eyes are the most common sensory organ to be lost due to any trauma, tumor, acid, fire, etc.<sup>2</sup> And planning for any extensive surgical procedure for the same can psychologically affect the patient due to the unaesthetic look and also the loss of function.<sup>3</sup>

Keratoprosthesis (KPro) surgery has traditionally been reticent for patients with severe visual impairment because of corneal clouding, in conditions where keratoplasty is known to have a destitute prognosis. The conception of utilizing a keratoprosthesis in eyes with corneal blindness has already been known for over 200 years. In the blind patients for whom the cadaveric corneal

transplantation is condemned to defeat, Osteo-Odonto Keratoprosthesis technique can be used.

### 2. History:

Since 1996, Sussex Eye Hospital (United Kingdom) has been the referral centre for osteo-odonto keratoprosthesis. Stempelli<sup>4</sup> discovered this procedure 40 years ago where a tooth-bone complex along with a plastic cylinder is used to replace the cornea.<sup>4</sup> and this treatment option has gained a lot of interest by the corneal surgeons all over the world. Formalize indications, contraindications, patient wish, surgical course, postoperative care, and and management of complicity has made Osteo-Odonto Keratoprosthesis a propitious surgical arrangement with excellent outcomes.<sup>5</sup>

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## Indications

- Stevens–Johnson syndrome (End stage)
- Cicatricial pemphigoid (Ocular)
- Physical eye injury, thermal or chemical burn (fire, acid, etc.)
- severe end-stage Trachoma
- More than one improper failed penetrating keratoplasty
- Lyell Syndrome
- Erythema multiforme
- Severe keratitis
- Xerosis
- Uveitis<sup>6</sup>

## Contraindications

- Patients gratified with their eyesight.
- Unilateral corneal blindness.
- Age < 18 years.
- Eyes with evidence of advanced glaucoma.
- Patients with no light perception, bad mouth hygiene, scarred BMM, unhealthy teeth, or edentulous patients.<sup>6</sup>

## Preoperative Evaluation

- A detailed patient history of presenting illness should be recorded to check for the etiology, clinical features, onset, signs and symptoms.
- B scan including axial size measurement should be done in dept for the patients seeking this treatment.
- Insight of brightness and correct rays projection is evaluated.
- Digital tonometry should be used to check for the Intraocular pressure.
- Adequacy of blink is authenticated.
- Patients should be examined for dental and oral mucosal evaluation.

- The in-depth instructions are verified prior to any arrangement / juncture for ensuring a comprehensive preoperative evaluation.

## Surgical Technique

The oookp course of action is described by various authors.<sup>5,6,8,9</sup>

This operation is staged, labor intensive, and comparatively extensive arrangement needing dental skill. (Table01)

✚ **Juncture 1** surgery entails covering the ocular surface with buccal mucous membrane graft along with harvesting a tooth for preparation of OOKP lamina.

- In *junction 1a*, the ocular surface is totally eliminated and restored with complete thickness buccal mucosal flap.<sup>8</sup>(Figure01)
- In *junction 1b*, a tooth (single rooted), along with the adjacent periodontal ligament fibers and alveolar bone are gathered(Figure02) and enforced as a organic skirt around the the plastic optical cylinder. (Figure03)
- This surgery is an artful, labor-sensitive, and nearly extensive conduct necessitating dental expertise.(Table01)
- The finished keratoprosthesis constructed with a tooth bone complex finely of 12 mm × 6 mm × 3 mm dimensions, with an plastic optical cylinder surrounded by 1mm dentine border.<sup>10</sup>(Figure04)
- This tooth-bone plastic cylinder complex is then fitted into the cheek mucosa, and gains the blood supply and remains viable. (Figure05).

✚ **Juncture 2** takes place after 2–4 months once the graft (buccal) has vessels that circulate fluids. Laminar destruction can occur if the lamina is in the pouch for more than 3 months.

- It will conclusively demand for the new lamina arrangement and ultimately the replication of juncture 1. Therefore, any delay in the waiting period should be prevented.<sup>11</sup>
- The tooth-bone cylinder complex (Figure06) is then removed from the cheek mucosa which is now covered with small blood capillaries and connective tissue.
- The epithelium covering the cornea is removed and a central trephination is carried out.

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- The implant is sutured over the cornea, after removing the iris, lens, and anterior vitreous.
- Exposing the opening over the plastic optical cylinder, epithelium is replaced over the entire corneal surface. (Figure07)

## STAGE 1

Preparation of Osteo odonto lamina	Harvesting of tooth along with bone	Drilling hole for optical cylinder	Removal or crown & cementation of cvlinder	Implantation into subcutaneous pouch
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## STAGE 2

Retrieval of buried Lamina	Reflection of buccal graft & exposure of cornea	Trephination of cornea	Removal ofof iris anterior vitrectomy	Lamina sutured & flap repositioned
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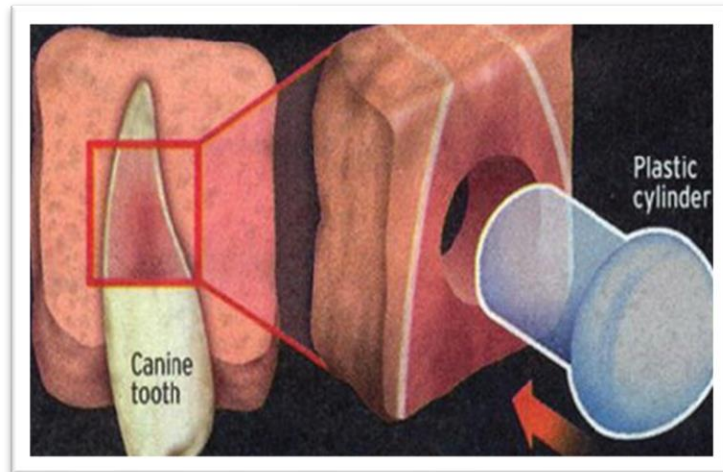
Table 01: Staged surgical procedure chart



Figure 01: Eye covered by buccal mucous membrane



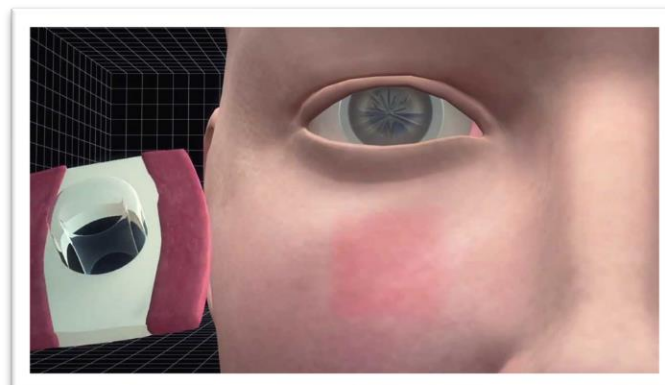
Figure 02: A cuspid and bicuspid tooth and adjacent bone and periodontal ligaments are excised.



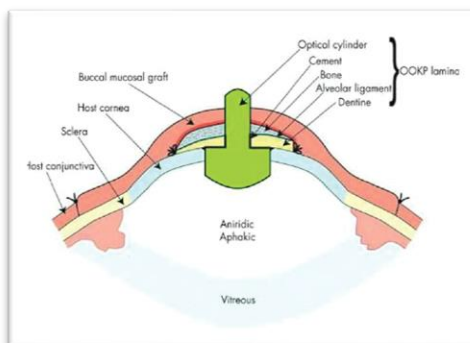
**Figure 03:** The tooth-bone plastic optical cylinder complex is formed.



**Figure 04:** Before implantation



**Figure 05:** The implant is now placed in the cheek mucosa to get vascularized.



**Figure 06:** Osteo Odonto Kerato Prosthesis



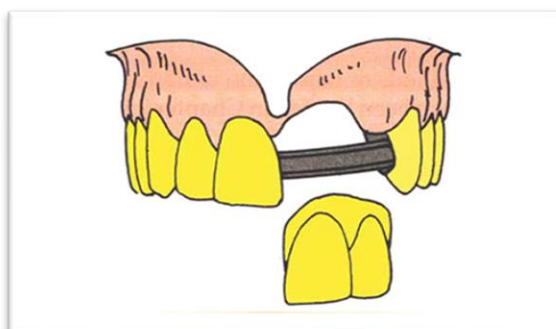
**Figure 07:** Preoperative and Post operative

### Prosthetic Replacement of the Missing Tooth

After the completion of the ookp surgery, patients are referred to the department of prosthodontics for the rehabilitation the lost tooth. To rectify the localized alveolar ridge defect esthetically is questioning.<sup>12</sup> A felicitous dental surgeon encourage patients to approve the finest conceivable replacement option after hearing the patients demand.<sup>13</sup>

Most of the patients do not prefer using removal prosthesis due to poor retention. As there is bone loss along with the tooth therefore planning for an implant treatment is not feasible. The finest coarse

of action for this condition would be Andrew's Bridge (Figure09). Dr.James Andrews of Amite, Louisiana proposed repaired detachable Andrew's bridge design.<sup>14</sup> It blends the vantage of fixed and removable prosthesis. It is composed up of a bar that is connected to the abutment tooth having crowns and over to which the removable pontic is fabricated. The advantage that Andrews bridge provides are recommendable, increasing retention, helping in phonetics, more stability, enhance esthetics, less weight, and hygiene maintenance. And this procedure will also further help in the routine follow up visits to check for the underlying tissue maintenance as the prosthesis can be easily detached.



**Figure 09:** Andrews bridge

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## Complications

- Fistula in the oroantral region
- Trophic diversification in mucosa
- Exposure in the Lamina
- Overgrowth of mucous membrane
- Hypotony
- Optic Cylinder migration
- Retinal Detachment
- Glaucoma
- Endophthalmitis
- Sterile Vitritis<sup>15</sup>

## Post Operative Care and Follow Up

Systemic antibiotics, corticosteroids and ocular hypotensive agents are administered until the patient could be discharged. Topical antibiotic ointments are prescribed for the functioned eye. Patients are normally seen afterwards one week of discharge from the hospital and again at one month, three months and six monthly after that.

Also, the digital assessment of the intraocular pressure, vitality of the cheek mucosa and stability of the implanted optical cylinder is evaluated. Fundoscopy is conducted along with the B- scan to verify the implanted site and also the check for glaucoma is monitored.<sup>18</sup>

## 3. Discussion:

The OOKP surgical technique<sup>5,16,17</sup> is already been exercised for the preceding 50 years. This surgical procedure is carried out by particularly expertise surgeons and is practiced in specialised centres throughout the world. The greatest current implication for this surgery are severe end stage steve johnson's syndrome and chemical and thermal burn. These cases have a very antagonistic ocular surface area, therefore the durability of the corneal graft or the transplantation of the ocular surface and other keratoprosthesis is compromised.

Nail Onycho keratoprosthesis could be utilized as an alternative to the Osteo-Odonto complex, and if it's removed from root of the nail it's bound to develop in the corneal region. The segment of 8th costal cartilage might be utilized.<sup>19</sup> Several surgeons are replacing the cornea with tibia bone (temprano-

keratoprosthesis). Bioceramics could be utilized at a pH of 6.5-5.<sup>20</sup>

Osteo-Odonto Keratoprosthesis provides 3 main benefits:

- (1) enduring fixation of a plastic lens,
- (2) alveolar dental tendon covered with mucosal ligament, and
- (3) Prosthesis long run retention.<sup>21</sup>

As mentioned by Falcinelli et al.,<sup>9</sup> the osteo-odonto keratoprosthesis has been the best treatment option when in comparison to the other options available. OOKP is an accurate heterotrophic autograft composed of residing tissue of human cells. The dentin, because of its insignificant metabolous swap, offers cohesion to ODA lamina over a stiff and perinnial call through resin with the plastic optical cylinder and delivers protection against cylinder extrusion and sinus formation. Hille et al.,<sup>22</sup> stated that there was a 5 year success with 100 % withholding power of Osteo-Odonto Keratoprosthesis lamina. Iyer et al.,<sup>15</sup> stated that in a study involving around 50 patients it was observed that there was a success rate of 96% when the patients were kept under observation for a period of 15 months.

To improve the adhesion between the plastic optical cylinder with the surrounding tissue of the eyes, many researchs are going on to find out new materials to replace the tooth bone complex.<sup>23-25</sup> By utilizing mitomycin C, it hinders with epithelial outgrowth on top of the artificial eye thereby reducing postoperative problems and increase the longevity.<sup>26</sup>

Amongst all, the accessible organic and artificial keratoprostheses, the Osteo Odonto Keratoprosthesis seems to supply the finest lengthy term anatomical and visual results for the treatment of the severe, end juncture cicatricial, or ocular surface inflammatory diseases.<sup>27</sup> In comparison to Osteo Odonto Keratoprosthesis, Boston type 1 KPro surgical arrangement is technically less tough but has a less succeed up anecdote. Osteo Odonto Keratoprosthesis, with well set up lengthy term triumph, is the primrose classic KPro, against which other KPros ought to be assessed.<sup>11</sup>

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Operative outcomes expose that contemporary Osteo Odonto Keratoprosthesis surgery has the ability to rehabilitate individuals with a certain degree of vision loss that can be reverted back to reciting words, perceiving faces, and guiding around traditional and unacquainted surroundings.<sup>8</sup>

## 4. Conclusion

Below the brightness of overhead said literature, the writers complete that the OKP surgical technique is very insisting on but at similar time is time-consuming. The forbearer can have a good central vision, they can also navigate and read the big alphabet, eat, and dress themselves without any help. But furthermore, studies are directed for greater exploration of outcomes and coming aspects.

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