A comprehensive Approach towards Orbital Trauma Reconstruction

in Cooperation with the S.O.R.G. Trauma Section
Today's imaging possibilities have increased surgeon's possibilities and patient's expectations considerably. The pictures show a large defect on patient's right side. Mirroring the intact left side (pink color) on the defective side (green color) shows the discrepancy between a symmetrical appearance and the existing fracture. The complex 3D-structure of the orbita floor is also clearly visible.

Case pictures courtesy of Prof. Jürgen Hoffmann, University Hospital Heidelberg
Orbital Reconstruction

Orbital reconstruction is a persistent challenge for every CMF surgeon as it comes in a multitude of different forms. Usually it is impossible to accurately reposition every bony fragment, leading to impairment and compromised aesthetic and functional outcomes. Another key question is, which material is better for a given defect? Certainly, biodegradable implants have an advantage because they give a clear answer on the subject whether or not to remove metallic implants in the orbits. But do they maintain sufficient support for a stable and parallel position of the eye over time? On the other hand titanium as well as all further alloplastic materials also have their disadvantages: Bony overgrowth may result in virtual impossibility to remove the osteosynthesis material. Finetuning of many existing alloplastic implants may lead to sharp crests or edges, which could then lead to complications with the delicate soft tissue structures close by.

In cooperation with the trauma section of the Strasbourg Osteosynthesis Research Group (S.O.R.G.), KLS Martin was seeking for a comprehensive approach to the management of orbital trauma. Based on the recognized classification of Jaquiéry et al. the trauma section has evaluated treatment principles according to size and extension of the fracture site. Additional instruments and tools are there to aid reconstruction in the operating room.

Classification of Orbital Trauma

Jaquiéry et al. differentiated between the following classes in orbital trauma:

- **Class I** Small, isolated defects of the orbital floor or the medial orbital wall of approx. 1 – 2 cm².

- **Class II** Defects of the orbital floor and/or the medial orbital wall > 2 cm². Bony structures of the medial wall of the infraorbital fissure are intact.

- **Class III** Defects of the orbital floor and/or the medial orbital wall > 2 cm², without bony structures of the infraorbital fissure.

- **Class IV** Defects of the whole orbital floor and the medial wall to the infraorbital fissure.
Class I Defects

- Small, isolated defects of the orbital floor or the medial orbital wall of approx. 1 – 2 cm².
- Defects of this size are the most frequent ones. They represent approx. 90% of all internal orbital trauma cases.
- As the bony support of the fracture site is still present, small biodegradable implants are usually the material of choice for reconstruction.
- Diplopia is usually not to be expected.
- The operation will usually be straightforward and should require minimal hardware involvement.

Biodegradable Solutions

NEW
Inferior support of the globe in cases with a small defect, round edge geometry, fixation is usually not required

- Resorb x® foil 17 x 17 mm
  - Thickness = 0.1 mm

- Membrane 25 x 25 mm
  - Thickness = 0.1 mm
Class II Defects

- Defects of the orbital floor and/or the medial orbital wall > 2 cm². Bony structures of the medial wall of the infraorbital fissure are intact.
- For defects of this extension resorbable material is usually the method of choice as a bony support is still to be expected.
- Because of the larger extension and the sometimes already complexer forms the use of the Xcelsior waterbath should be considered.

Biodegradable Solutions

Mesh for orbital floor
Ø = 23 mm
δ = 0.6 mm

Mesh
Ø = 0.3 mm
Tip in order to protect the posterior optic nerve. Fixation by SonicPins Rx®

Membrane 25 x 25 mm
δ = 0.1 mm

Membrane 25 x 25 mm
δ = 0.1 mm

Membrane 50 x 20 mm
δ = 0.1 mm

Membrane 50 x 20 mm
δ = 0.2 mm

Membrane 30 x 30 mm
δ = 0.2 mm

Membrane 40 x 40 mm
δ = 0.2 mm

Exploration of icons
- Resorb x®
- Units/pack
- Plate profile
- STERILE® sterile packed implants
Class III Defects

- Defects of the orbital floor and/or the medial orbital wall > 2 cm², with loss of the bony structures of the infraorbital fissure.

- This defect is certainly on the borderline between biodegradable (Resorb ×) and titanium reconstructions.

- Depending on the surgical technique and the access used, the surgeon will choose either resorbable or metal implant.

- Consequently, the KLS Martin product portfolio includes both kinds of products.

**Biodegradable Solutions**

- Mesh for orbital floor
  - Ø = 23 mm
  - = 0.6 mm

- Mesh
  - = 0.3 mm

- Mesh for orbital floor
  - Ø = 30 mm
  - = 0.6 mm

- Mesh for orbital floor
  - Ø = 30 mm
  - = 0.6 mm

- Mesh for orbital floor
  - 40 x 40 mm
  - = 0.6 mm

- Mesh for orbital floor
  - 40 x 40 mm
  - = 0.6 mm

- NEW!
  - With reduced tip in order to protect the posterior optic nerve. Fixation by SonicPins Rx®
New Titanium Solution for Class III and Class IV Defects

One Implant with a Lot of Options!

While still easy to insert, the optimized S.O.R.G. orbita floor implant offers a considerable support to the eye globe. Various cutting options allow uneventful adjustment of the implant. Below you will find some of the possible modifications which correspond to variation of the orbita trauma encountered. The implant can be applied on both sides of the orbit.

In cases with lacking bony support, the central medial bar can be seated posteriorly in order to additionally stabilize the position of the eye.

Cutting Options

- Complete reduction of the medial wing
- Cutting options of the posterior segment
- Partial reduction of the medial wing
- Further posterior reduction
- Example for asymmetric cutting of the orbital floor plate only
- Partial cutting back of the medial wall and the posterior segment

Explanation of icons

- Resorb x
- Units/pack
- Plate profile

Sterile packed implants
Class IV Defects

- Defects of the whole orbita floor and the medial wall to the infraorbital fissure.
- Lazy-S-geometry requires accurate contouring.

Class IV defects always show lack of bony support for any kind of implant. They may differ considerably in form and extension. Therefore only titanium implants are suggested. They should be easy to bend and cut, without leaving sharp edges, which could interfere with surrounding soft tissues.

New Titanium Solution for Class III and Class IV Defects

One Implant with a Lot of Options!

While still easy to insert, the optimized S.O.R.G. orbita floor implant offers a considerable support to the globe. Various cutting options allow uneventful adjustment of the implant. On page 7 you will find some of the possible modifications which correspond to variation of the orbita trauma encountered. The implant can be applied on both sides of the orbit.

25-044-01-09
Orbital floor plate, non-preshaped, symmetrical
= 0.3 mm

25-044-02-71
Orbital floor plate, 3D-preshaped, for patient's left side
= 0.4 mm

25-044-03-71
Orbital floor plate, 3D-preshaped, for patient's right side
= 0.4 mm
Intraoperative situation of the patient on page 2. The fracture lines are getting obvious.

Further Titanium Options for Class III and IV Defects

1.0 mm Micro System

Mesh for orbital floor, contoured

1.5 mm Micro System

Mesh for orbital floor, contoured
Orbital Forming Device

In order to achieve an anatomically correct reconstruction, it is essential to carefully predesign the chosen implant. Being suitable for both resorbable and metallic implants, the KLS Martin orbital forming device is the perfect adjustment tool in order to preshape your selected implant.

Determined by projection and geometrical interpolation of multiple CT scans, the orbital forming device represents the size and shape of the average European adult person.

The orbital forming device can be cleaned and autoclaved for surgical use under sterile conditions.
Orbital Rim Fractures

Biodegradable Solutions

1⁄1

52-076-08-04  
Orbita plate, 8-hole
= 1.0 mm

52-176-08-04  
Matching bending template

Titanium Solutions

1.0 mm Micro System

1⁄1

25-332-08-09  
= 0.6 mm

25-332-08-71  
= 0.6 mm

1.5 mm Micro System

1⁄1

25-325-08-09  
= 0.6 mm

25-325-08-71  
= 0.6 mm

25-325-10-09  
= 0.6 mm

25-325-10-71  
= 0.6 mm

2.0 mm Mini System

1⁄1

50-400-06-09  
= 0.6 mm

50-400-06-91  
= 0.6 mm

50-400-08-09  
= 0.6 mm

50-400-08-91  
= 0.6 mm

50-405-12-09  
= 0.7 mm

Explanation of icons

Titanium
Resorb x*
Aluminium
Units/pack
Plate profile

STERILE  |  Sterile packed implants
Instruments, Tools and Helpers

**INNOVATION: Orbital Reconstruction**

**Metzenbaum-Lahey**
11-965-14-07
14.5 cm / 5 5/8"
slender pattern

**Kaye**
13 cm / 5 1/4"

**Desmarres**
15-091-08-07 - 15-091-18-07
16 cm / 6 3/4"
Rowe
38-691-01-07 - 38-691-02-07
19 cm / 7 ¼”

38-693-19-07
20 cm / 7 ¾”
Instruments, Tools and Helpers

INNOVATION: Orbital Reconstruction

Donovan
38-694-20-07
19.5 cm / 7 5/8"

Cutter

25-050-13-07
13 cm / 5 3/8"

Mesh cutter

25-052-13-07
12.5 cm / 4 7/8"
Byrd
38-709-03-07
10 cm / 4”
Zygoma reduction screw

Or alternatively:
Byrd
25-438-35-07
8 cm / 3 1/8”
Reduction screw for big screwdriver handle

Byrd
25-407-04-04
12 cm / 4 1/4”
Screwdriver handle

38-697-01-07
20 cm / 7 7/8”
Spatula, orbital, straight, malleable, 2 different working ends

38-697-02-07
18 cm / 7 1/4”
Spatula, orbital, straight, malleable

38-697-02-07
18 cm / 7 1/4”
Spatula, orbital, straight, malleable

NEW
NEW
NEW
Orbital Reconstruction Set

Suggestion for the Set Configuration

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<th>Description</th>
<th>Item No.</th>
<th>Qty:</th>
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<td>Kaye Face-lift Hooklet, 13 cm / 5 1/8&quot;, 5-pronged</td>
<td>28-215-04-07</td>
<td>1</td>
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<tr>
<td>Desmarres Saddle Hook, 12 mm, 16 cm / 6 7/8&quot;</td>
<td>15-091-12-07</td>
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<td>15-091-16-07</td>
<td>1</td>
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<td>Metzenbaum-Lahey Dissecting Scissors</td>
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<td>Donavan Orbital Rim Retractor, 19.5 cm / 7 1/8&quot;</td>
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<td>Cutter, 13 cm / 5 1/4&quot;</td>
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<tr>
<td>Mesh Cutter, 13 cm / 5 1/4&quot;</td>
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<td>1</td>
</tr>
<tr>
<td>Orbita Retractor, straight, maleable, 2 different working ends</td>
<td>38-697-01-07</td>
<td>2</td>
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<tr>
<td>Orbita Retractor, straight, maleable</td>
<td>38-697-02-07</td>
<td>1</td>
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<tr>
<td>Byrd Zygoma Reduction Screw</td>
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<td>Orbital Forming Device</td>
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### Storage Proposal

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<tr>
<td>Storage Tray for Miniset Container 277 x 171 x 54 mm</td>
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<td>Silicone Mat for Miniset Container</td>
<td>55-009-09-04</td>
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<td>Microstop® Miniset Container 310 x 189 x 90 mm</td>
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<td>Logistic Frame white for Container</td>
<td>55-864-11-04</td>
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<td>Coding Label w/o hole for the Lid</td>
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*In addition*

| Storage Solution for 1.0 mm micro, 1.5 mm micro, 2.0 mm Mini and/or SonicWeld® Implants |         |

*according to components selected*
References

- Jaquiéry, C., et al.,
  Reconstruction of orbital wall defects: critical review of 72 patients.

- Gear, A. J. L., et al.,
  Safety of titanium mesh for orbital reconstruction.

- Kamer, L., et al.,
  Orbital form analysis: problems with design and positioning
  of precontoured orbital implants: a serial study using
  post-processed clinical CT data in unaffected orbits.

- Lamecker, H., et al.,
  A method for the three-dimensional statistical shape analysis
  of the bony orbit.
  Proc Computer Aided Surgery Around the Head, 2007,
  S. 94 – 97
Additional Brochures

SonicWeld Rx®
Patient Specific Implants
Osteosynthesis 1.0 Micro

Osteosynthesis 1.5 Micro
Osteosynthesis 2.0 Mini
Sterilization Containers MicroStop®
General Catalog