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# 3 Preparation of the Operating Field

Besides the general surgical goals of asepsis and anesthesia, preparation of the operating field in ophthalmic surgery serves the essential function of *creating optimum space-tactical conditions* for the impending operation.

All measures are directed toward
- *establishing the largest possible margin of deformation* (see Fig. 1.56), and
- *eliminating all factors that reduce or jeopardize this margin of deformation.*

All preparatory measures should be planned with these goals in mind, for they determine the range of options and freedom of manipulations that will be available to the surgeon throughout the operation.

## 3.1 Lowering the Pressure in the Intraocular Chambers

Preoperative reduction of the intraocular pressure is the essential means for establishing a generous margin of deformation. All other measures are directed toward maintaining this margin of deformation and ensuring that portions of it are not consumed before the operation begins. The general intraocular pressure can be lowered by drugs that decrease aqueous production (e.g., carboanhydrase inhibitors, beta blocking agents) or by measures that reduce the vitreous volume (e.g., osmotically active drugs, mechanical compression of the globe). Only the latter measures can affect the vitreous chamber.

## 3.2 Anesthesia

There are two ways in which *anesthesia assists spatial tactics* at the start of the operation:

- By *suspending ocular motility*, it eliminates eye movements that might deform the open globe.
- By *reducing myogenic tone*, it increases the passive mobility of the globe.

The anesthesia should be applied by a technique which avoids *external pressure* that might alter the lid or orbital volume.

All current anesthesia techniques accomplish the primary goal of anesthesia – the elimination of pain. However, none satisfies all requirements in terms of spatial tactics,

Table 3.1. **Comparison of various anesthetic techniques.** The colored squares show where practical techniques satisfy the requirements of an ideal anesthesia

| | Insensibility | Akinesia | Effect on passive mobility of the globe: Increase | Effect on passive mobility of the globe: Decrease | Effect on margin of deformation, Danger of decrease: during initial phase | Effect on margin of deformation, Danger of decrease: during final phase |
|---|---|---|---|---|---|---|
| Ideal anesthesia | + | + | + | – | – | – |
| Instillation anesthesia | + | – | – | – | – | – |
| Retrobulbar anesthesia | + | + | + by relaxation of muscles | + by infiltration of orbital tissue (dose dependent) | + by infiltration of orbital tissue (dose dependent) | – |
| General anesthesia | + | + | + with muscle relaxation | (+) without relaxation | (+) in case of technical difficulties: (defense, agitation, vomiting) | (+) |

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and so the selection of an anesthesia technique is always a *compromise* (Table 3.1). If the disadvantages of a particular technique are too objectionable in a given situation, different techniques may be combined for an optimum result.[1]

### 3.2.1 Instillation Anesthesia

The ocular structures most sensitive to pain are the integument (conjunctiva and cornea) and the anterior uvea (iris and ciliary body). Topical anesthetics such as oxybuprocaine and lidocaine are employed to desensitize the conjunctiva and cornea. Deep-acting anesthetics such as cocaine can provide anesthesia for most intraocular procedures. Instillation anesthetics are adequate for procedures in which unrestricted muscular motility does not compromise the surgical goal.

### 3.2.2 Injection Anesthesia

Injection anesthesia may be applied as *infiltration anesthesia* or *conduction anesthesia*. Besides eliminating pain, it can paralyze the extraocular muscles and thus prevent ocular and lid movements.

A disadvantage of injection anesthesia is that it increases the *periocular tissue volumes*, whether by the volume of the injected anesthetic or by inadvertent hematoma formation. This jeopardizes the margin of deformation.[2] Thus, the injection technique takes into account not only the anatomy of the target structures (e.g., ciliary ganglion, ocular muscles, palpebral muscles, facial nerve) but also means for avoiding a localized volume increase. Uniform distribution of the injected anesthetic can be enhanced by adding hyaluronidase to the solution.[3]

### 3.2.3 Akinesia of the Orbicularis Muscle

Temporary paralysis of the orbicularis oculi prevents closure of the lids. **Direct infiltration** of the muscle (Fig. 3.1C) produces a swelling of the lids that may interfere with the conduct of the operation. **Conduction anesthesia** of the facial nerve does not affect the operative field. *Preauricular akinesia* (Figs. 3.1A, 3.2A), requires only a small amount of anesthetic. It blocks all the zygomaticotemporal fibers but may also block the descending branches, causing transient oral paralysis. *Paraorbital akinesia* (Figs. 3.1B and 3.2B) infiltrates the nerve over the bony orbital rim. The infiltrated area is larger and should include the fibers supplying the outermost parts of the orbicularis, which are very active in lid closure.

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[1] Examples:
- General anesthesia and local infiltration may be combined to prevent ocular and lid movements during recovery from the general anesthesia.
- Instillation anesthesia can be combined with other techniques in patients with large ocular perforations, where eye contents may be extruded due to straining or coughing during induction of general anesthesia or to an increase in the intraorbital volume during infiltration anesthesia. The preliminary placement of a few temporary sutures under instillation anesthesia will lessen the vulnerability of the globe to the side-effects of the other anesthetic measures.

[2] There is particular danger when anesthetic must be reinjected after the eye has been opened. In this case the margin of deformation can be increased by temporarily closing the wound with sutures before performing the reinjection.

[3] Hyaluronidase promotes diffusion of the anesthetic in the tissue by the depolymerization of interstitial hyaluronic acid; it has no effect on proteins (e.g., capillary walls, sclera, fibrin, clotted blood). The action of hyaluronidase is enhanced by pressure to the injected area (compression, massage).

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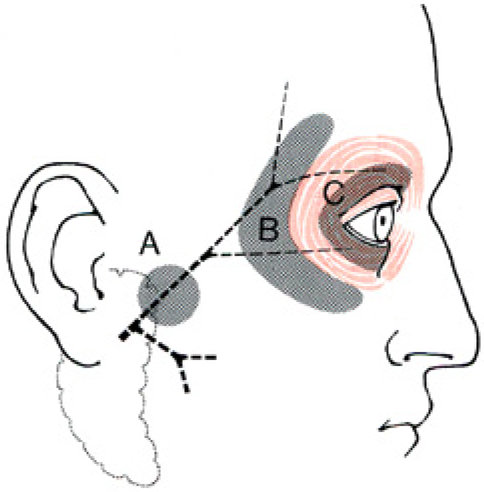


Fig. 3.1. **Methods of producing orbicularis oculi akinesia**
*A* Preauricular conduction anesthesia. *B* Parorbital conduction anesthesia. *C* Direct infiltration of the orbicularis oculi

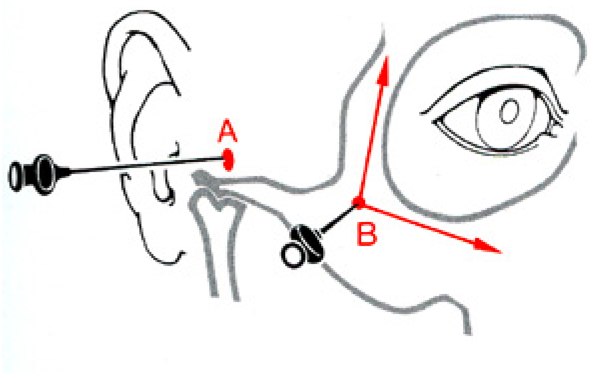


Fig. 3.2. **Injection sites for conduction akinesia**
*A Preauricular injection*: About 1 $cm^3$ is injected anterior to the tragus (i.e., anterior to the mandibular tuberosity, identified by palpation during jaw motion) at a depth of 1 cm.
*B Parorbital injection*: The needle is inserted over the highest point of the zygomatic arch and is passed upward and nasally along the bony orbital rim. The needle is withdrawn to the tip before it is redirected inferiorly (less traumatizing than "sweeping" the needle through the tissue)

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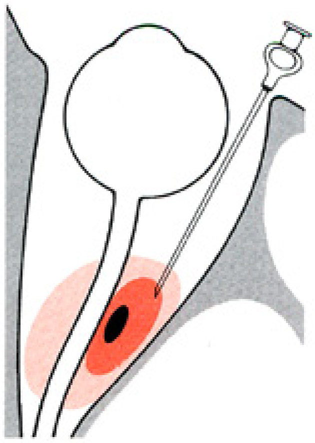


Fig. 3.3. **Retrobulbar infiltration.** To avoid optic nerve injury, the needle is kept in the temporal half of the orbit and should penetrate no farther than 1.5 cm behind the globe

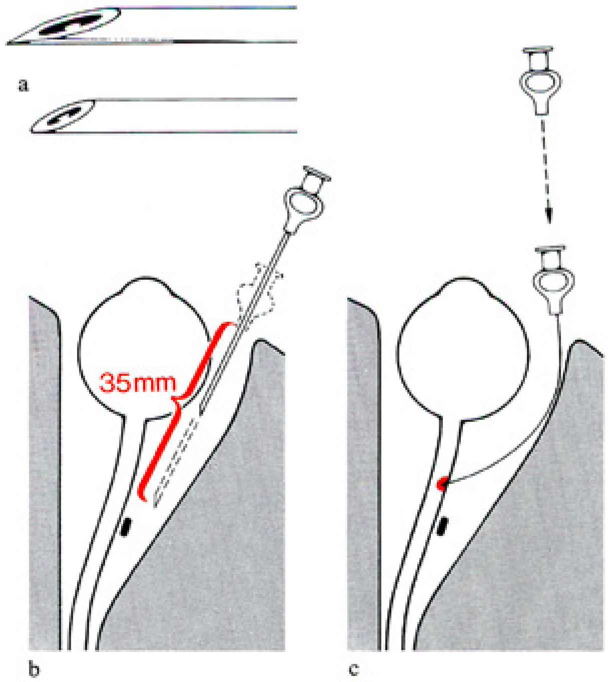



Fig. 3.4. **Requirements of the injection needle**

**a** *Tip*: A sharp tip (*above*) may cause inadvertent injury, so a tip with lower cutting ability (*below*) is preferred.

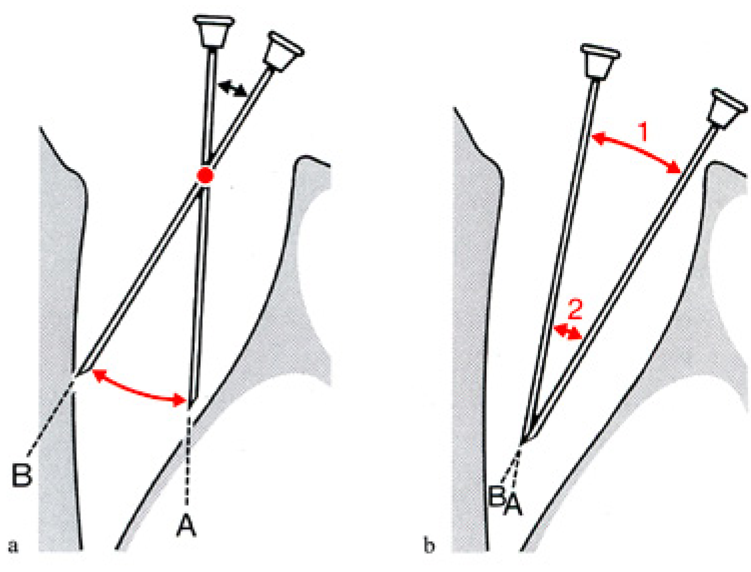
**b** *Length*: 3.5 cm or less (from the orbital margin) to spare the apex.

**c** *Rigidity*: While rigid needles are easy to direct with accuracy (as shown in **b**), flexible needles follow the path of least resistance and are more apt to stray. An attempt to correct this by forcibly redirecting the needle may achieve the opposite result (here: redirection to the right causes deviation to the left)

Fig. 3.5. **Guidance motions for intraorbital injection**

**a** If the needle is pivoted about a fulcrum at the *orbital rim* to redirect it from *A* to *B*, the tip will sweep through the intraorbital tissues and, behaving as a sharp instrument, may cause undetected injury.

**b** If the needle is redirected from *A* to *B* by pivoting it *at its tip*, the tip position remains stable. Instead the needle will displace tissues at the orbital margin (*1*), but there it behaves as a blunt instrument; also, the orbital rim tissues are not as critical as the deep intraorbital tissues. Redirection is even less problematic when the needle is inserted transconjunctivally. In this case the needle enters the orbit farther posteriorly, and the amplitude of tissue shifts during corrective maneuvers is reduced (*2*)

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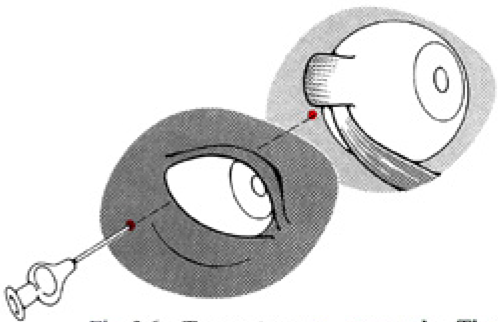

Fig. 3.6. **Transcutaneous approach.** The needle is inserted in the lower temporal quadrant, below the tarsus. Rotating the eye upward and nasally removes the inferior oblique muscle from the needle path and stretches the peribulbar tissue, which is then pierced more easily

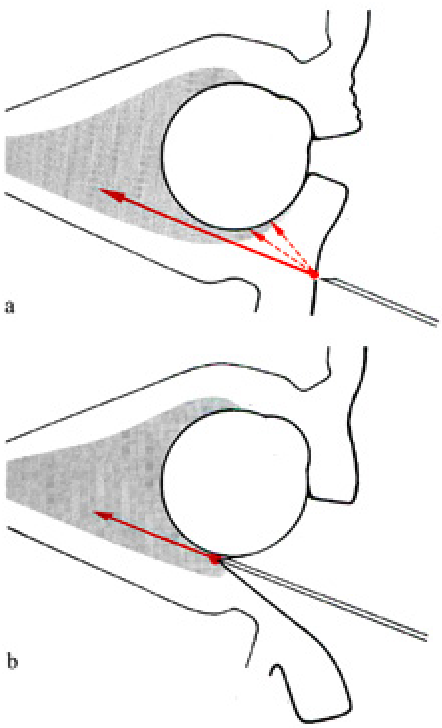


Fig. 3.7. **Comparison of transcutaneous and transconjunctival injection**

**a** *Transcutaneous injection*: A misdirected needle can perforate the globe (*dashed arrows*). The steeper the angle of insertion and the longer the globe (myopia), the greater the danger.

**b** *Transconjunctival injection*: The needle is inserted behind the equator and will either miss the globe completely or bypass it at a tangent. The needle enters the muscle cone directly

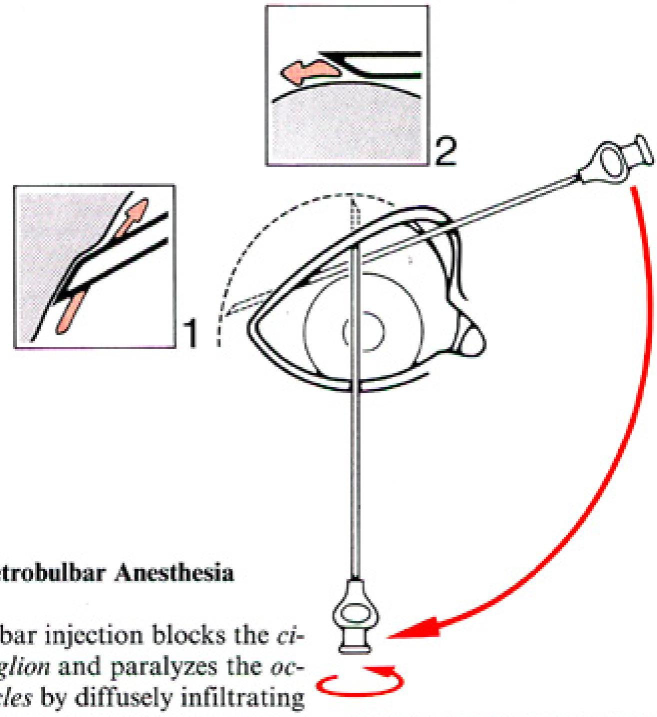


Fig. 3.8. **Technique of transconjunctival injection.** The drawing shows the technique for injection through the superior fornix, where the insertion site is covered by the tarsus of the upper lid. (An analogous technique may be used in the inferior fornix, although this site is more easily accessible.) The transconjunctival injection consists of two phases: maneuvering the needle to the insertion site in the fornix, and advancing the needle to the target in the orbit.

*1* The insertion site in the hidden superior fornix is located by applying the needle at a more easily accessible part of the fornix (i.e., the lateral or nasal canthus) and sweeping it upward to the insertion site (*long arrow*) with the blunt side facing the fornix conjunctivae (*inset 1*).

*2* At the insertion site the needle is thrust through the conjunctiva and passed along the globe toward the orbital apex. The blunt side of the needle should face the ocular surface to avoid injury (*inset 2*); this is ensured by rotating the needle 90 degree about its own axis upon insertion (*short arrow*)

### 3.2.4 Retrobulbar Anesthesia

Retrobulbar injection blocks the *ciliary ganglion* and paralyzes the *ocular muscles* by diffusely infiltrating the posterior portions of the muscle cone. The orbital apex is vulnerable, however, because the optic nerve, veins, and other structures are so closely related that they will not yield to an advancing needle and are susceptible to puncture (Fig. 3.3). This danger can be reduced by using *cannulas* of an appropriate shape, length, and rigidity (Fig. 3.4) and by using an appropriate *guidance technique* (Fig. 3.5).

In the **transcutaneous injection** the cannula reaches the muscle cone by piercing the lid, orbital septum, fascia, and orbital fat (Figs. 3.6, 3.7a). It encounters a relatively high, superficial cutaneous resistance that may make it difficult to appreciate the resistance offered by deeper structures.

For **transconjunctival injection** the cannula is inserted at the fornix (Fig. 3.8) and is passed through the periocular fascia *directly into the muscle cone*. The major difference between transcutaneous and transconjunctival injection is that in the latter, the cannula tip is inserted beyond the largest ocular diameter and so is unlikely to perforate the eye (Fig. 3.7b).[4]

[4] When the globe is open (e.g., injection in case of traumatic perforation or reinjection during intraocular surgery), the transconjunctival route is hazardous. Resistance at the insertion site in the fornix can exert traction on the conjunctiva which may be transmitted to the wound margins and cause them to separate. To prevent this, the conjuctiva must be immobilized with a fixating forceps close to the site of injection.

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## 3.3 Maintaining Separation of the Lids

### 3.3.1 Methods of Opening the Lids

**Simple separation of the lids** (Fig. 3.9) recapitulates the natural lid-opening movement, and all movements are consistent with the normal function of anatomic structures. However, this method affords limited exposure and does not eliminate lid pressure on the eye.

**Lid retraction** (Fig. 3.10) is effected by pulling the eyelids away from the globe, resulting in an *unphysiologic deformation of the entire lid region*. Specifically, the lid margins are stretched and tend toward a circular shape. This "*palpebral circle*" (Fig. 3.11) is formed by pulling the upper and lower margins outward and orbitally, and the lateral margin inward and frontally.[5] The level occupied by the palpebral circle when the lid margins are on maximum stretch depends on the resistance of adjacent tissues. In the absence of anatomic obstructions, this level corresponds to the plane between the insertions of both lateral palpebral ligaments at the orbital margin.

The movements associated with lid retraction cause a widespread *shifting of tissue* that can affect the orbital pressure. *Raising* the palpebral circle away from the globe (Fig. 3.12a) relieves pressure on the orbit, while *lowering* the circle toward the globe (Fig. 3.12b) increases the resistance from the orbital cushion, and passive ocular mobility is reduced. Should the globe come in *direct contact* with the margins or lid retractors, it may be deformed directly (with an associated decrease in the margin of deformation).

For these reasons every effort should be made to *raise* the palpebral circle away from the globe. If this does not happen spontaneously by virtue of the orbital anatomy (Fig. 3.13a), active outward traction must be applied during lid retraction (Fig. 3.13b). The distensi-

[5] In theory both the inner and outer canthi should move inward. But due to the strong fixation of the nasal canthus, only the lateral canthus is mobile.

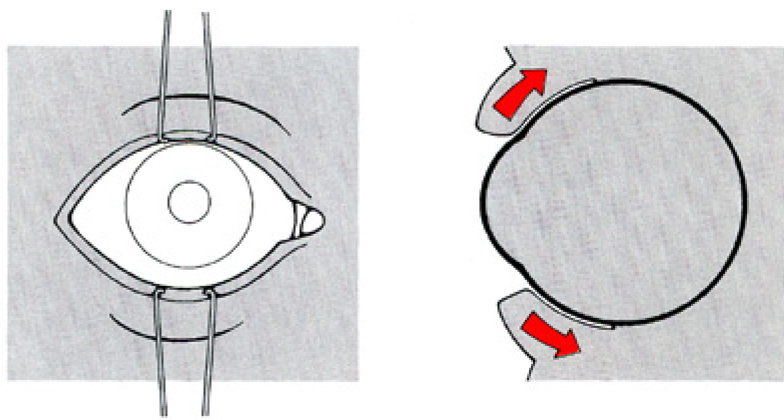

Fig. 3.9. **Simple separation of the lids** produces a normal palpebral aperture with a normal direction of traction

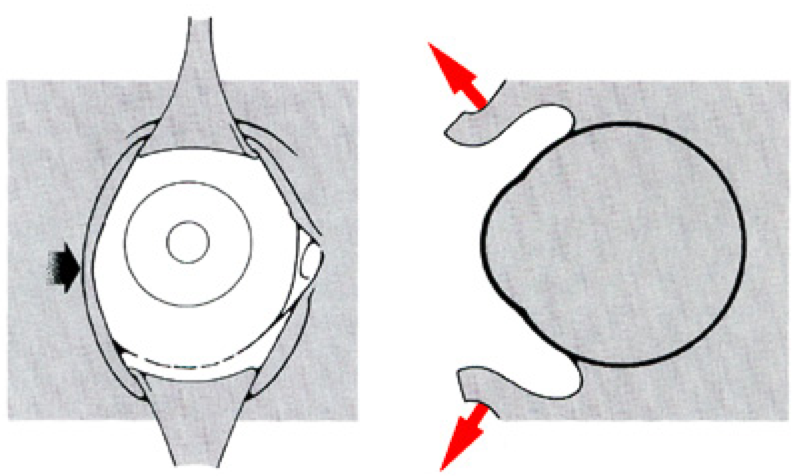

Fig. 3.10. **Lid retraction** enlarges the palpebral aperture beyond the physiologic width by lifting the eyelids away from the globe

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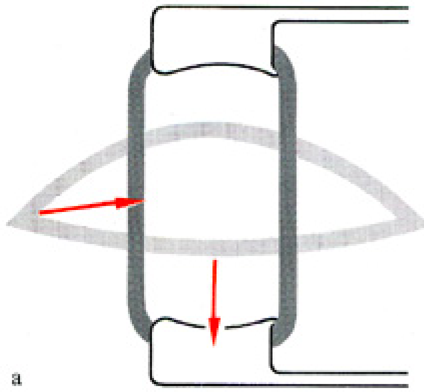

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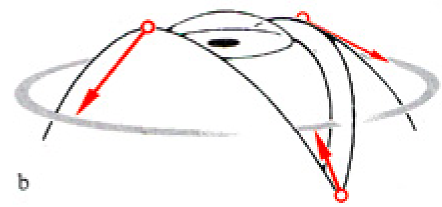

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Fig. 3.11. **Formation of palpebral circle by stretching of the lid margins.** When stretched, the lid margins tend toward a circular shape.

**a** When the palpebral aperture is increased in the vertical dimension, its transverse diameter is reduced, and the lateral lid margin is pulled inward. If tension is uniform, a circle results. Maximum separation with lid retractors may produce an upright ellipse, especially following canthotysis.

**b** In an attempt to lie on one plane, the upper and lower lid margins move outward and downward while the lateral margin moves inward and upward

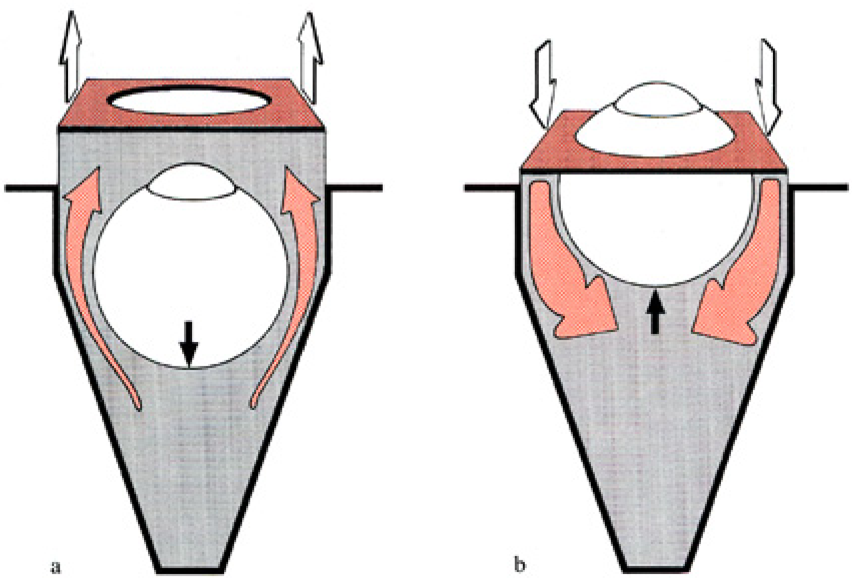

Fig. 3.12. **Movement of the palpebral circle in relation to the globe**

**a** When the circle is raised, tissue from the orbital cavity is pulled forward: the globe recedes, the eye muscles relax, and passive mobility of the globe is increased.

**b** Lowering the circle compresses the orbital tissue: the globe is pressed forward, and passive mobility is decreased

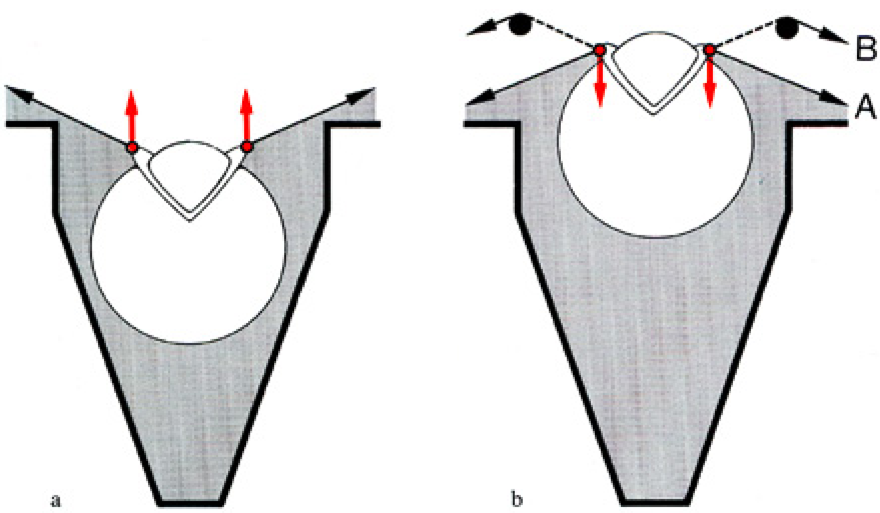


Fig. 3.13. **Positioning the palpebral circle.** Effect of the direction of lid traction on the position of the palpebral circle.

**a** If the globe is deeply set, lid traction toward the orbital margin creates outward-directed vectors, and the palpebral circle is raised.

**b** If the globe is protuberant, lid traction toward the orbital margin (*A*) has an inward-directed component, and the palpebral circle is lowered. To raise the circle, traction must be redirected by means of struts (*B*) to create the situation shown in **a** (*broken line*)

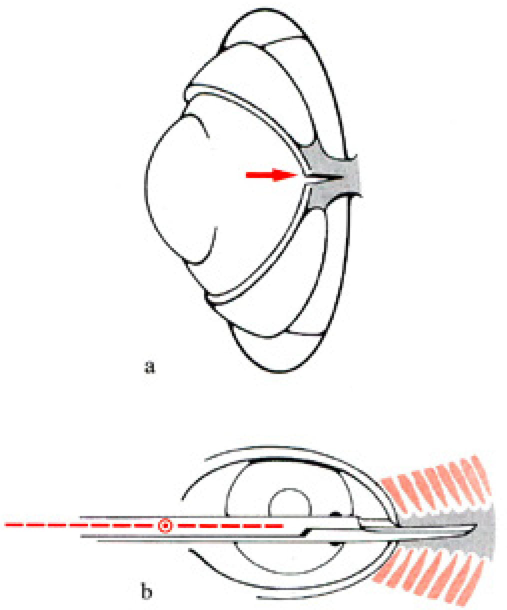


Fig. 3.14. **Canthotomy**

**a** The incision to enlarge the palpebral circumference causes minimal trauma when made along the lateral muscle raphe.

**b** This raphe is on the line connecting the inner and outer lid margins and is engaged by applying a straight scissors to the temporal canthus while keeping its handle directly over the nasal canthus. The contiguous tissue layers (skin, fat, muscle, lateral palpebral ligament) are compressed beforehand with a clamp to keep them from shifting during cutting

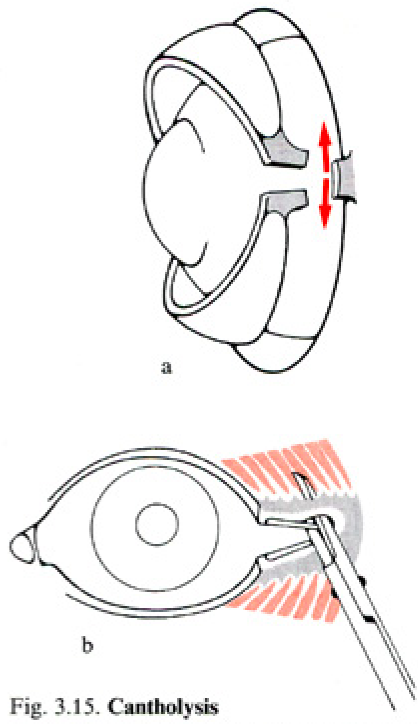


Fig. 3.15. **Cantholysis**

**a** If a tight lateral ligament prevents elevation of the palpebral circle, its arms are separated from their periosteal attachment.

**b** The ligamentous attachments are located through the canthotomy incision by probing upward and downward along the inner orbital margin. Cutting directly over the periosteum will help prevent hemorrhage. Traction on the tarsus makes it easier to identify the ligaments and assess the effect of the procedure

bility of the lateral palpebral ligament places an anatomic limit on the level to which the palpebral circle can be raised.

The configuration of the palpebral circle can be surgically altered by **canthotomy** (Fig. 3.14). This increases the palpebral circumference and so relieves direct pressure from the lid margins. **Cantholysis** (Fig. 3.15), or division of the palpebral ligaments, is indicated if these bands prevent the palpebral circle from being raised adequately.

### 3.3.2 Instruments for Maintaining Lid Separation

**Traction sutures** (Fig. 3.16) are ideal for effecting and maintaining *lid separation*. If they are used for *lid retraction*, however, difficulties can arise: Because they act only at the lid margins, the sutures have a tendency to evert the tarsus if the globe is recessed, and to lower the palpebral circle if the globe is protuberant (Fig. 3.13). In this case their efficiency can be improved by passing them over special *supports* on the cheek and forehead.

**Lid hooks** are inserted beneath the lid margin to effect *retraction*. The diameter and level of the palpebral circle can be adjusted as needed with **simple lid hooks** (Fig. 3.17), but these must be handled by an experienced assistant who can deal with special situations as they arise. In the **self-retaining lid retractor** (lid speculum), the hooks for the upper and lower lids are interconnected. If the speculum

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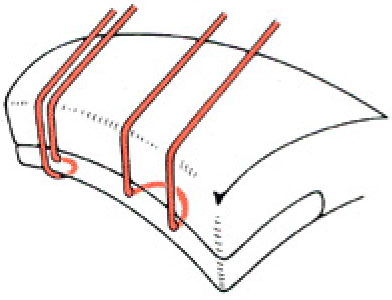


Fig. 3.16. **Traction sutures** are most effective when passed through the tarsus. This anchors them in firm tissue, and there is no danger of hemorrhage from the muscle or marginal artery

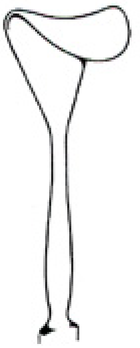


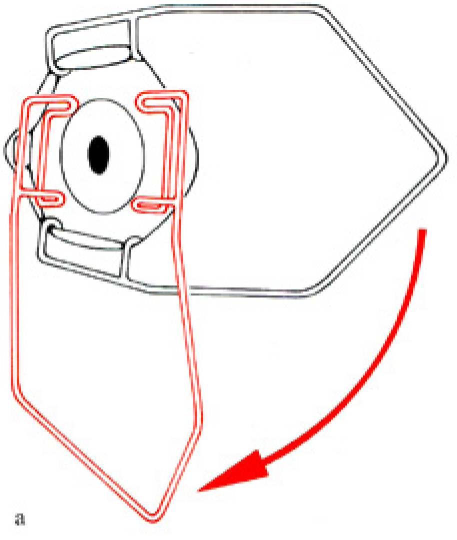
Fig. 3.17. **Simple lid hooks**. The back of the hook conforms to the curvature of the ocular surface at whatever angle it is applied

is of the *spring tension* type, the lid aperture depends entirely on the interaction between the lid tension and spring tension and cannot be adjusted (Fig. 3.18a). If retraction is maintained by a *screw thread* or *screw clamp* mechanism, a specific aperture can be set and adjusted as needed (Fig. 3.18b). The net weight of the instrument determines whether it can travel upward (i.e., outward) with the palpebral circle. Heavy retractors depress the circle and must be elevated away from the bony orbital margin by mechanical supports.

Fig. 3.18. **Self-retaining lid retractors**

**a** Light wire speculum with spring tension. For removal, the retractor is rotated 90° (*arrow*), moving the hooks into the horizontal meridian where the palpebral aperture has its largest diameter.

**b** Lid speculum of the screw-clamp type. For removal, the branches are grasped near the connecting post and are first spread apart slightly (*arrow*) to loosen before they are slid together



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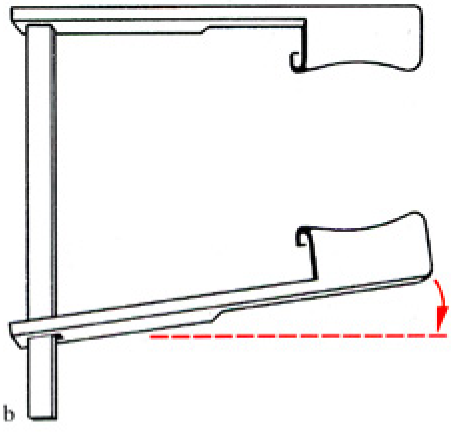

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## 3.4 Fixation of the Globe

Since all forces applied to the globe have both a *deforming* and a *displacing* action, the surgeon can increase the resistance to one in order to increase the effect of the other. Increasing the resistance to passive mobility aggravates the risk of deformation, while improving passive mobility reduces the risk of deformation.

Fixation serves to *limit the passive mobility* of the globe so that the intended force vectors of surgical instruments can be optimally applied. However, if *unplanned forces* such as muscular traction act on an immobilized globe, there is a danger of deformation that can be averted only by immediately releasing the fixation so that ocular mobility is restored.

In **point fixation** (Fig. 3.19), passive ocular movements are prevented only if the applied force vectors pass through the center of rotation of the eye and the point of instrument fixation. All vectors from other directions will cause lateral rotation of the globe. Thus, *unplanned forces* tend to displace the globe rather than deform it.

**Zonal fixation** (Fig. 3.20) immobilizes the eye against vectors from various directions. However, one result of the improved fixation is that unplanned forces[6] now tend to deform the globe rather than displace it.

The **quality of the fixation** depends on the firmness of the *tissue between the fixation instrument and the sclera*. It is best when the globe is grasped directly by the sclera. Fixation by ocular adnexa is most effective when applied close to their site of attachment (i.e., muscles are grasped near their insertion, the conjunctiva near the limbus).

*Note*: The center of rotation for eye movements is at the ocular center for duction movements with fixation instruments, but rotation takes place about the fixation point for manipulations with operative instruments.[7] As a result, the right and left hand will rotate the globe about different points (Fig. 3.21).

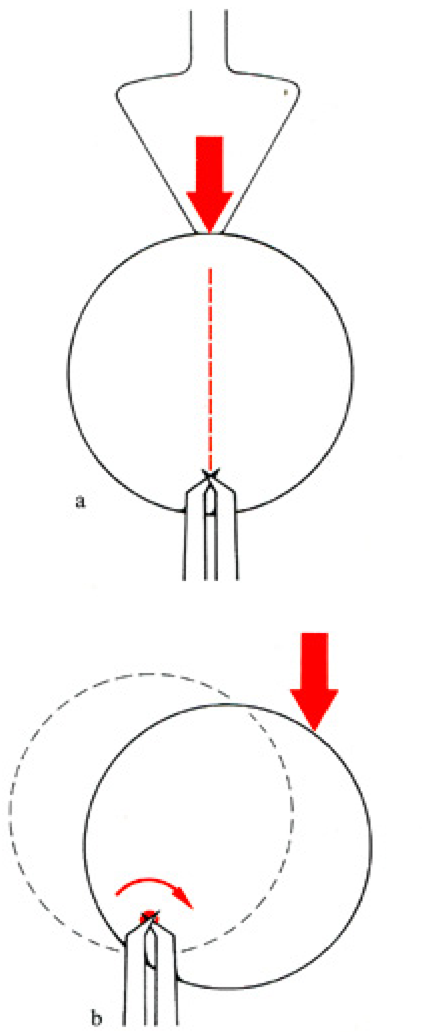


Fig. 3.19. **Effect of point fixation**

**a** Point fixation resists only the force vector passing through the center of eye rotation and the fixation site.

**b** Vectors from other directions *displace* the globe. The center of rotation for this motion is the point at which the fixation instrument is applied

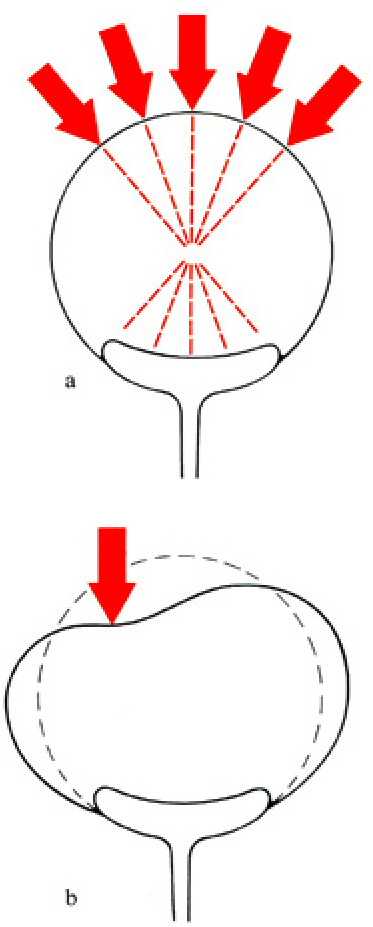


Fig. 3.20. **Effect of zonal fixation**

**a** Zonal fixation immobilizes the eye against vectors from various directions.

**b** Since zonal fixation effectively reduces passive mobility, applied forces *deform* the globe

[6] Such as resistance to a blunt cutting instrument.

[7] The pattern of resistances may be such that the operating instrument itself (e.g., a blunt cutting instrument) produces a fixation effect, further complicating the rotational movements of the globe.

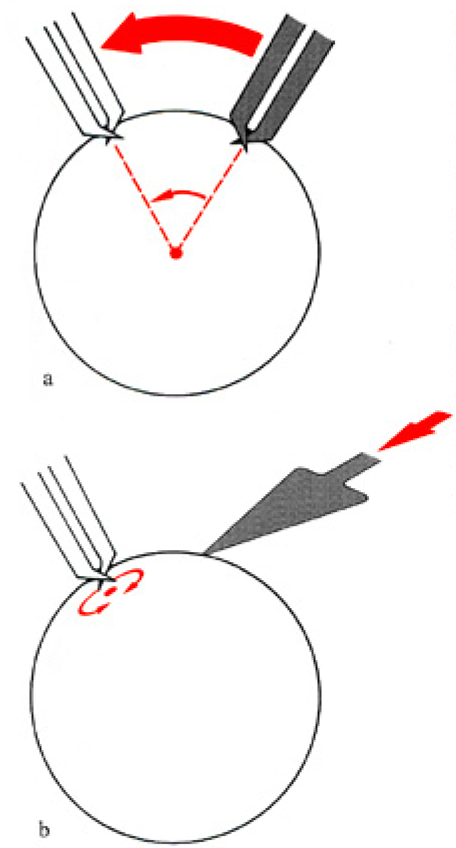


Fig. 3.21. **Centers of rotation for passive eye movements**

**a** Intentional rotation of the eye with fixation instruments occurs about the geometric center of the globe (see Fig. 1.44c).

**b** The fixation instrument forms the center of eye rotation when actions are performed on the globe with other instruments

## 3.5 Traction Sutures for Orienting the Globe

Traction sutures can be used to rotate a particular part of the globe into the operative field. The extent of the rotation depends on the site of suture placement relative to its fulcrum (Fig. 3.22).

The suture may be attached directly to the sclera or to the adnexa. If the tissue between the suture and the sclera is firm (e.g., attachment to the sclera or a muscle insertion), any traction on the suture will produce a corresponding rotation of the globe. If the intervening tissue is more compliant (e.g., attachment to a tendon or muscle belly), only part of the traction is transmitted to the globe; the eye retains some passive mobility, and this can provide a safety factor in case unplanned forces are applied.

*Note*: *Immobilization* is *not* the actual purpose of traction sutures. If the suture does exert a fixating effect, it should be released at once if the eye is moved by unplanned forces such as active muscular contraction. Otherwise the globe will be deformed.

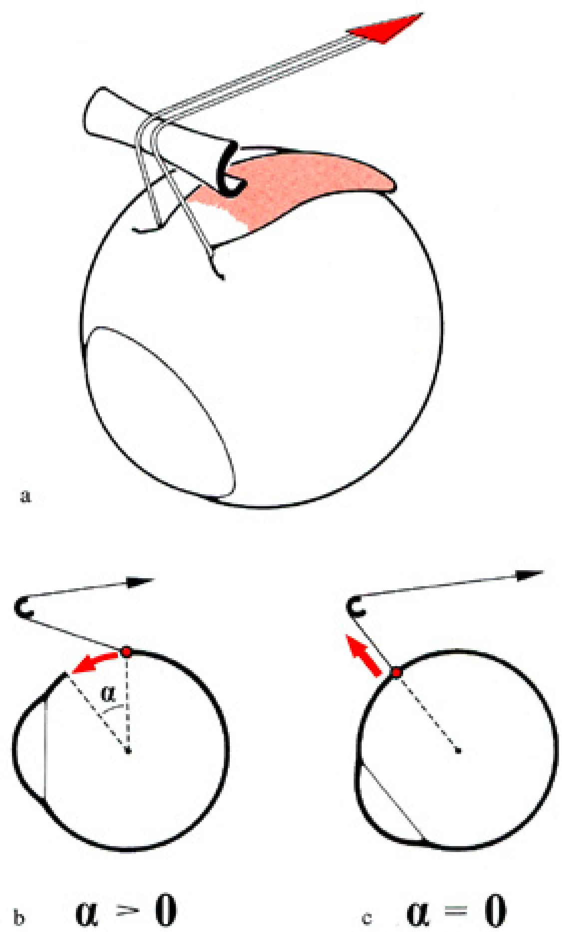


Fig. 3.22. **The rotating action of traction sutures** ►

**a** The suture is passed back over the fulcrum formed by the edge of the lid retractor.

**b** The rotation produced by the suture is determined by the angle $\alpha$ between the line joining the center of rotation with the fulcrum, and the line joining the center of rotation with the point of suture attachment.

**c** When $\alpha = 0$, rotation ceases. Further traction on the suture only raises (and may deform) the globe

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## 3.6 Sutured-On Stabilizing Rings

**Local rings** (see Fig. 1.46d) are specially configured to stabilize the *wound margins* for ocular wall excisions and for the accurate fitting of grafts.

**Rings for protecting the vitreous chamber** (see Fig. 1.47) prevent complications in case of destruction of the *diaphragm*. They are used in situations where there is preexisting damage to the diaphragm, or where a rupture of the diaphragm is anticipated during the course of the operation.

The rings themselves can be a *source of deformation* if attached too tightly (Fig. 3.23), so it is prudent to leave the sutures slightly loose. This will not compromise the function of the ring, since the ring in effect becomes part of the scleral system which itself is not completely rigid.

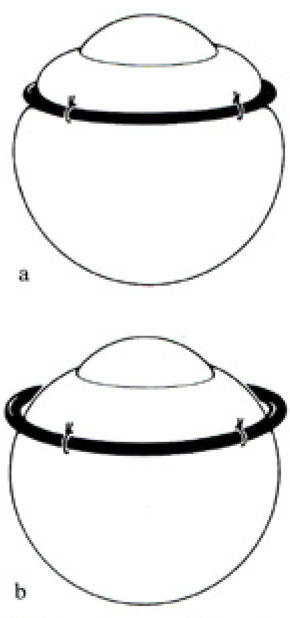


Fig. 3.23. **Sutured-on stabilizing ring**

**a** If attached too tightly, the ring will deform the globe.

**b** Even with slightly loose attachment the ring can preserve the anatomy of the diaphragm

## 3.7 Placement of Transconjunctival Muscle Sutures

If a muscle or tendon must be grasped through the conjunctiva for the purpose of placing a traction suture or stabilizing ring, *statistical data* can be used to estimate the appropriate *distance from the limbus* for the grasping maneuver (Fig. 3.24).

Bleeding is avoided by passing the needle through the *interspace between the muscle and sclera*. This space is defined by *elevating* the muscle away from the sclera. The muscle is grasped through the conjunctiva with a mouse-tooth forceps whose tooth is appropriate for the thickness of the intervening tissue layer (Fig. 3.25). Since the teeth can grasp the tendon only when *perpendicular* to the ocular surface, the intended grasping site must be rotated into view either with a second instrument[8] or with the grasping forceps itself (Fig. 3.27).

On insertion of the needle, inadvertent *perforation* of the sclera is avoided by directing the needle tip strictly parallel to the surface of the globe (Fig. 3.26). Tactile feedback is enhanced by holding the needle stationary and moving the versatile mouse-tooth forceps toward the needle, rather than moving the heavier needleholder toward the fixated muscle.

[8] Examples: Forceps applied at the inferior limbus; squint hook thrust into the lower fornix.

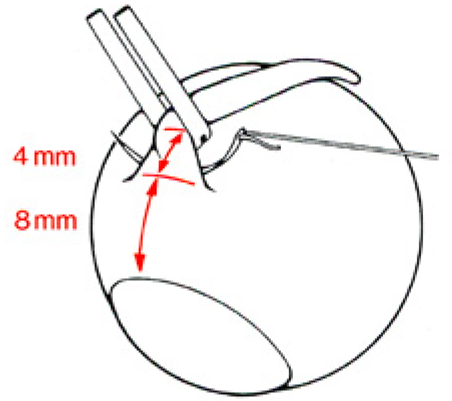


Fig. 3.24. **Transconjunctival muscle suture.** The tendon is grasped far enough behind its insertion that it can be compressed into a bulge. The needle is passed close to the scleral surface

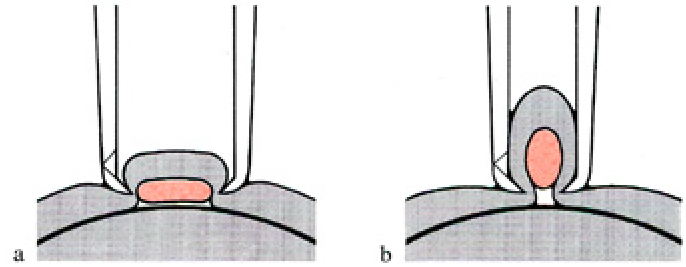


Fig. 3.25. **Grasping through the conjunctiva**

**a** To grasp the muscle, the forceps blades are opened *wider than the muscle* width so that the teeth with the included layer of conjunctival tissue can slip beneath the tendon.

**b** Bringing the blades together causes the tendon to bulge away from the ocular surface

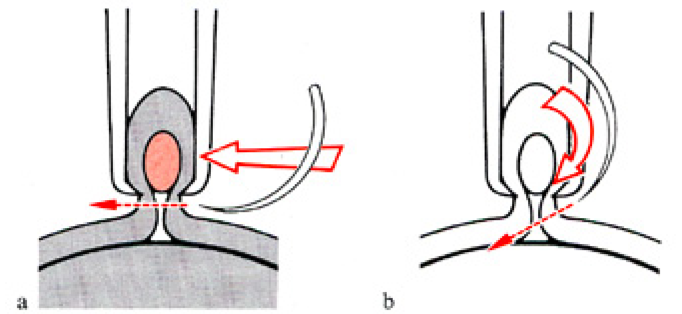


Fig. 3.26. **Passing the muscle suture**

**a** The needle tip is pushed underneath the tendinous bulge, keeping it parallel to the scleral surface.

**b** Passing the needle in a rotary motion creates vector components directed toward the sclera, with risk of perforation

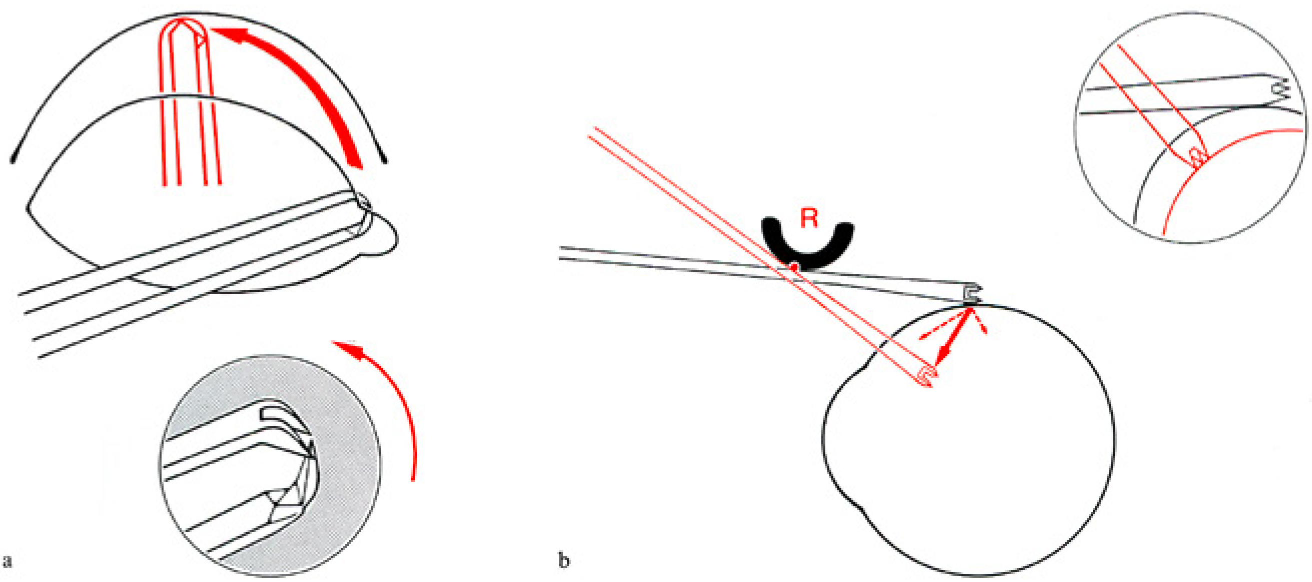


Fig. 3.27. **The presentation of tendons covered by the tarsus**

**a** *Using the forceps to rotate the eye*: The forceps is applied laterally at an accessible part of the fornix and from there is swept upward beneath the lid. *Inset*: Smooth forceps gliding is ensured by closing the blades until the tips just meet (closure is not complete). The two-toothed blade leads, protecting the tissue from the tip of the single-toothed blade.

**b** To keep the teeth from slipping off the muscle, they are pressed against the eye surface (once in place) by bracing the forceps against the fulcrum of the lid retractor (*R*). The teeth are not closed until they are perpendicular to the eye surface (*inset*), for only then is their grip effective

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## 3.8 Final Check of Preparations

Preparation of the operative field must be undertaken with the greatest care, for errors in this phase jeopardize the conduct of the operation and may be impossible to correct later on.

Before the operation actually begins, a final check is made to confirm that the goals of the preparatory phase have been accomplished:

1. **Efficacy of anesthesia**:
   - elimination of *pain sensation*
   - *akinesia* of the extraocular muscles
2. **Unrestricted passive mobility of the globe**:
   - relaxation of the extraocular muscles
   - no exophthalmus through orbital infiltration or hemorrhage
3. **No direct deformation of the globe.** No contact of globe with lid margins or lid retractor.
4. **Low intraocular pressure.** This is the sign of a large margin of deformation and is the most important preoperative safety criterion.