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PRACA POGLĄDOWA
REVIEW

Complications after blepharoplasty: a review of the literature

Powikłania po blefaroplastyce: przegląd piśmiennictwa

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ABSTRACT

INTRODUCTION: Blepharoplasty is a surgical procedure to correct or reconstruct the upper or lower eyelids. The main purpose of performing these surgeries is to correct the signs of aging that occur in the periorbital region and to improve the appearance of unsightly eyelids. Eyelid surgery is also used in the correction of ophthalmic conditions. The purpose of this review is to describe the most common complications after blepharoplasty of the upper or lower eyelids, to analyze the cause of the complications, and to propose methods of prevention and correction.

REVIEW: It is important to understand how and why complications occur after eyelid surgery. Most postoperative complications fall into one of four categories: (1) inaccurate preoperative evaluation, (2) improper surgical technique, (3) poor intraoperative assessment, and (4) idiopathic complications. Complications associated with this type of surgery include bleeding, infection, corneal injury, double vision, eyelid regurgitation (lagophthalmos), eyelid drooping (ptosis), lacrimal gland damage, dry eye syndrome, an asymmetric eyelid crease line, residual excess skin and subcutaneous tissue, eyelid furrow deformities, canthal webbing, and burns.

CONCLUSIONS: Blepharoplasty, despite being one of the most commonly performed plastic surgery procedures in the world, is not the easiest of procedures to perform. It is associated with a number of complications, which can have a major impact on the end result of the operation or even on the patient's quality of life. Knowledge of all the complications and how to prevent them is crucial for any surgeon who wants to achieve good postoperative results.

KEYWORDS

blepharoplasty, eyelid surgery, complications, plastic surgery

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STRESZCZENIE

WPROWADZENIE: Blefaroplastyka to zabieg chirurgiczny polegający na korekcie lub rekonstrukcji powiek górnych lub dolnych. Głównym celem wykonywania tych procedur jest zniwelowanie oznak starzenia się występujących w okolicy okołooczodołowej oraz poprawienie wyglądu nieestetycznych powiek. Plastyka powiek znajduje również zastosowanie w korekcji schorzeń o podłożu okulistyczno-funkcjonalnym. Celem niniejszego przeglądu jest opisanie najczęstszych powikłań po blefaroplastyce powiek górnych lub dolnych, analiza przyczyn powikłań oraz zaproponowanie metod zapobiegania im oraz ich korekcji.
PRZEGLĄD: Ważne jest zrozumienie, w jaki sposób i dlaczego dochodzi do powikłań po plastyce powiek. Większość powikłań pooperacyjnych należy do jednej z czterech kategorii: (1) niedokładna ocena przedoperacyjna, (2) niewłaściwa technika chirurgiczna, (3) zła ocena sytuacji śródoperacyjnej, (4) powikłania idiopatyczne. Do powikłań towarzyszących tego typu zabiegom należą: krwawienie, infekcje, urazy rogówki, podwójne widzenie, niedomykanie powiek (*lagophthalmos*), opadanie powieki (*ptosis*), uszkodzenie gruczołu łzowego, zespół suchego oka, asymetryczna linia załamania powieki, pozostały nadmiar skóry i tkanki podskórnej, deformacje bruzdy powiekowej, *canthal webbing* oraz oparzenia.
WNIOSKI: Blefaroplastyka, mimo że jest jednym z najczęściej wykonywanych zabiegów chirurgii plastycznej na świecie, nie należy do najłatwiejszych procedur. Wiąże się z licznymi powikłaniami, które mogą znacząco wpłynąć na ostateczny wynik operacji, a nawet na jakość życia pacjenta. Znajomość wszystkich możliwych powikłań oraz metod zapobiegania im jest kluczowa dla każdego chirurga, który chce osiągać dobre wyniki pooperacyjne.

SŁOWA KLUCZOWE

blefaroplastyka, chirurgia powiek, powikłania, chirurgia plastyczna

INTRODUCTION

Blepharoplasty is a surgical procedure to correct or reconstruct the upper or lower eyelids. The main purpose of performing these surgeries is to correct the signs of aging that occur in the periorbital region and to improve the appearance of unsightly eyelids [1]. Eyelid surgery is also used in the correction of ophthalmic conditions. Blepharoplasty of the upper eyelids is aimed at functional and cosmetic improvement, while the primarily purpose of procedures of the lower eyelids is cosmetic improvement [2]. As the population ages, the demand for both cosmetic and functional blepharoplasty is increasing [3,4]. This procedure, performed on the upper eyelid, involves excision of the excessive skin fold and, if necessary, removal of the corresponding portion of the eye's circular muscle and fat pads [2]. If the procedure involves the lower eyelids, the way it is performed depends on the patient's individual anatomical conditions [2].

REVIEW

Epidemiology

Eyelid surgery is one of the most commonly performed plastic surgery procedures in the world [5]. Blepharoplasty has been in the top 5 most commonly performed surgical procedures over the past 10 years, right next to rhinoplasty and facelift [1]. In 2021, it was ranked third by the International Society of Aesthetic Plastic Surgery (ISAPS) [6]. The frequency of performing blepharoplasty increased by 18.1% from the previous year [6]. Based on ISAPS data, it is estimated that 1,142,957 procedures were performed among women and 303,932 procedures were performed among men in 2021 worldwide [6].

Indications

The most common functional indication for upper eyelid blepharoplasty is upper eyelid excess skin (dermatochalasis), eyelid drooping (blepharoptosis). For cosmetic reasons, patients often want a more visible upper eyelid crease and filling of the superior palpebral furrow. Indications for lower eyelid blepharoplasty include a prominent nasolabial groove, lower eyelid asymmetry, bulging of upper eyelid fat (steatoblepharon), and lower eyelid protrusion exposing the eyelid conjunctiva [7,8]. Most of these indications are characterized by herniation of the orbital fat pads and protrusion of the lower orbital margin [8]. Although it is a minor surgical procedure, like any it carries the risk of complications [4].

Complications

It is important to understand how and why complications occur after eyelid surgery. Most postoperative complications fall into 1 of 4 categories: (1) inaccurate preoperative evaluation, (2) improper surgical technique, (3) poor intraoperative assessment, and (4) idiopathic complications [3]. Complications associated with this type of surgery include bleeding, infection, corneal injury, double vision, eyelid regurgitation (lagophthalmos), eyelid drooping (ptosis), lacrimal gland damage, dry eye syndrome, an asymmetric eyelid crease line, residual excess skin and subcutaneous tissue, eyelid furrow deformities, canthal webbing, and burns [3,4,7,9]. The purpose of this review is to describe the complications after

blepharoplasty of the upper and lower eyelids, to analyze the cause of the complications, and to propose methods of prevention and correction.

Bleeding

The eyelid and its surrounding areas have a rich blood supply, making bleeding during blepharoplasty inevitable. The patient's intake of anticoagulants [3] or uncontrolled increases in blood pressure during the preoperative and postoperative periods are risk factors for early, but also late, postoperative hematoma [10]. With blepharoplasty, the most common are preseptal hematoma as well as periorbital and extraocular hematoma. In the case of preseptal hematoma, blood from the ruptured vessel collects focally, or spills over into the surrounding tissues [3]. These hematomas usually pose no threat to vision, but can lead to varying degrees of scarring, eyelid misalignment, pigmentation abnormalities and discomfort [3]. It is recommended that ice cooling and compression be applied to the affected area.

The most feared hematoma after blepharoplasty, is an extraocular hematoma [7]. This is an extremely rare complication, occurring in about 0.055% of cases [10]. As the name suggests, it is an accumulation of blood in the space behind the eyeball. The volume of the orbit is 30 cm^3 [3], and it is designed to tolerate a small amount of fluid, but rapid hemorrhage is not well compensated. The pressure in the orbit increases causing venostasis, which raises intraocular pressure even more, resulting in a decrease in arterial blood flow, and as a result, orbital compartment syndrome [11,12]. In addition, there is a pushout of the eyeball forward manifested by proptosis. If the pressure inside the orbit exceeds the pressure in the central retinal artery, ocular perfusion is impaired. If this continues for more than 60 to 100 minutes, the patient is at the risk of permanent vision loss [13]. Extraocular hematoma manifests as decreased vision, a tense orbit, restricted eye movements and anisocoria [3]. The management of such a diagnosis is urgent lateral canthotomy and cantholysis. When the orbital pressure does not decrease or continues to increase, surgical control of bleeding and surgical decompression of the orbit should be performed [3].

Infection

Due to the good blood supply to the operated area, the rate of infection after blepharoplasty surgery is relatively low, ranging from 0.04% to 0.2% [14]. The most common is anterior blepharitis, which is confined to the eyelid itself [3]. It manifests as a red, tender and swollen eyelid. If not properly treated, the infection can spread to the orbit, causing orbital cellulitis and even necrotizing fasciitis [15], which are serious complications. Signs of orbital involvement include decreased vision, pupillary abnormalities, decreased eye movement and proptosis. The most common microbes are Staphylococcus and Streptococcus bacteria, and even atypical mycobacteria [3,16]. Treatment is based on oral antibiotic therapy, or in more severe cases, intravenous therapy. While antibiotics have increasingly limited therapeutic use against antibiotic-resistant strains, surgical antisepsis is still the best way to lower postoperative infections.

Corneal injuries

Corneal abrasion can be a complication of eye surface exposure during blepharoplasty [3]. It can occur through direct irritation of the cornea during surgery or during the postoperative period through irritation by surgical sutures [17]. Other corneal injuries associated with eyelid procedures are keratitis and partial or full--thickness corneal perforations. Corneal perforations involving the entire layer of the cornea are usually associated with the use of a laser during surgery or the preoperative administration of local anesthesia to the eyelid [18]. Patients with corneal damage usually report pain and reduced visual acuity. The Seidel test with fluorescein is used to assess the depth of corneal damage. The appearance of a trail of dye diluted by aqueous humor on the corneal surface indicates a full--thickness defect of the cornea. Most patients with corneal injuries as a complication of blepharoplasty are reported to have improvement in visual acuity in comparison to their preoperative condition. However, many develop corneal scarring, which does not enable the recovery of preoperative visual acuity [18]. The use of corneal shields in blepharoplasty procedures depends on the operator's preference. They have the advantage of a mechanical barrier to protect the cornea. Nonetheless, cases of corneal abrasions caused by the use of shields have been described in the literature [18].

Diplopia

When double vision occurs after blepharoplasty, it is important to determine whether it is monocular or binocular, and whether it is temporary or permanent. Monocular diplopia can result from the use of ointments and eye drops, interruption of the tear film or epithelial damage [3]. Temporary binocular diplopia can be caused by the penetration of local anesthetics into the extraocular muscles and impairment of them until the anesthetic is flushed out [3].

In the case of permanent monocular or binocular double vision, there are two main mechanisms of injury. The most common is decompensation through surgical interference of a pre-existing imbalance between the extraocular muscles [19]. Therefore, a thorough physical examination of the patient before surgery is crucial to maximally reduce the risk of complications. The second mechanism involves mechanical damage

by the operator to the inferior rectus or oblique muscles in lower eyelid blepharoplasty and the superior rectus or oblique muscles in upper eyelid blepharoplasty [3,19,20,21]. The trochlea of the superior oblique muscle tendon is located close to the supraorbital rim, during aggressive removal of the fat pad from the nasal side; it can be damaged, causing iatrogenic Brown syndrome [3]. The superior rectus muscle is connected by a fibrous membrane to the upper eyelid elevator muscle. In the case of partial resection of the upper eyelid levator muscle, the superior rectus muscle can mistakenly be damaged as well, hence intraoperative checking of ocular mobility is crucial [21]. If we talk about injuries during lower eyelid procedures, the main reason is the fact that the inferior oblique muscle separates the medial fat pad from the central one. It runs below the inferior rectus muscle. Therefore, the inferior oblique muscle is prone to injury during deep dissection of the medial or central fat pads, and the inferior rectus muscle during extensive dissection in the central fat pad. Aggressive dissection, the use of high coagulation energies, traction or hemorrhage at these sites can result in paresis or scarring with restriction, manifesting as double vision [20].

Lagophthalmos

Lagophthalmos is the patient's inability to close the eyelids completely, which is necessary to distribute the protective tear film throughout the eye. Failure to close the eyelid results in exposure of the cornea, which is associated with tear film evaporation or maldistribution, followed by exposure keratopathy, threatening corneal ulceration or perforation [22]. Clinically, lagophthalmos can be divided into temporary (lasting 2 to 3 weeks after surgery) and persistent chronic (longer than 3 months) [3]. Temporary can be associated with swelling and/or postoperative pain, injection of the anesthetic into the circular muscle of the eye, or traumatic myopathy [3]. When eyelid malfunction persists longer and does not resolve after a few weeks following surgery, we may suspect more serious causes for such a condition. The most common cause of chronic lagophthalmos is excessive eyelid skin resection. It is established that 20 mm of eyelid skin, measured from the center of the eyelid margin to the natural line of the eyebrow is sufficient to close the eyelid effortlessly [3]. Other causes of chronic lagophthalmos also include excessive resection of the eye's circular muscle, damage to the facial nerve (causing paralysis of the orbicularis muscle) and suturing of the orbital septum after it has been opened [3,4]. Treatment of this complication is based on maintaining an artificial protective layer on the cornea in the form of ointments and eye drops, and if the injury is permanent, reoperation and correction may be necessary [22].

Ptosis

The levator muscle of the upper eyelid and Muller's muscle are the two muscles responsible for lifting the upper eyelid [23]. Eyelid drooping can occur if they are damaged or if the levator aponeurosis, horns of the levator muscle complex or Whitnall's ligament are damaged during blepharoplasty. For direct damage to these structures to occur, the orbital septum must be opened, for example to reduce the fat pads. Eyelid drooping can also be caused by excessive postoperative swelling of the eyelid or bleeding, leading to separation of the aponeurosis [19]. To be certain that eyelid drooping is a complication of the surgery, and not pre--existent drooping such as involuntary ptosis, the patient should be carefully examined before qualifying for surgery [3]. It should be acknowledged that obscuring the upper eyelid margin due to excess skin (dermatochalasis) can mimic ptosis. The best way to confidently diagnose eyelid drooping is to measure the distance from the corneal light reflex to the edge of the eyelid in the primary gaze, known as the margin-reflex distance (MRD). Ptosis is defined by a MRD of 2.5 mm or less [3].

Dry eye syndrome

According to the definition established in 2017, dry eye syndrome is an ocular surface disease characterized by a loss of tear film function, with ocular symptoms present due to tear film instability, hyperosmolarity, inflammation or damage to the ocular surface and neurosensory abnormalities [24]. Contrary to previous beliefs, resection or incision of the ocular orbicular muscle does not correlate with increased dry eye syndrome symptoms [25,26,27]. The pathophysiology of dry eye syndrome symptoms is due to the surgical interference in the eyelid, tear film and ocular surface system. This affects the distribution of the tear film on the cornea, which is compounded by potential complications of the procedure, in the form of impaired eyelid closure caused by postoperative eyelid drooping, ectropion or dysfunction of the lateral canthus. All of these factors add up to cause postoperative dry eye disease [9]. The basis for avoiding this blepharoplasty complication is accurate patient classification before surgery, proper surgical technique and postoperative care. The patient should have a thorough medical history and a tear film break test or Schirmer's test before surgery to rule out the presence of dry eye syndrome already before the procedure. During the procedure, the main focus should be on protecting the cornea, establishing the borders of the surgery by marking the incision line and minimizing bleeding. Postoperative prevention of edema, inflammation and infection is recommended [9].

Lacrimal gland damage

Lacrimal gland damage is a serious complication of blepharoplasty. It can significantly affect the comfort as well as the health of the patient's eye. The gland is located behind the lateral orbital rim and can therefore be accidentally damaged or removed if mistaken for the lateral fat pad, significantly increasing the risk of complications [3]. Although blepharoplasty is mostly an aesthetic procedure, it carries the risk of serious functional complications such as permanent dry eye, foreign body sensation, corneal damage and even a loss of vision if the lacrimal gland is compromised [3,7]. In addition, damage to the gland can also lead to gland prolapse, which is characterised by displacement of the gland from its natural anatomical location, causing a visible bulge and functional impairment [3]. These changes not only affect the aesthetic appearance, but can also lead to chronic dry eye [7]. The cause of lacrimal gland prolapse may be aging of the orbital septum and weakening of the supporting ligaments, leading to changes in the anatomical structure of the eye [28]. Lacrimal gland prolapse is quite common, affecting approximately 15% of patients prior to blepharoplasty [4]. Misdiagnosis of this condition and inadvertent excision of the gland can lead to severe deterioration of corneal hydration [28]. If the gland is found to be prolapsed, repositioning of the gland using non-absorbable sutures is recommended as a treatment procedure to restore its normal function [3]. As many as 60% of patients who undergo blepharoplasty experience problems with tear gland prolapse, especially those with a history of multiple eyelid surgeries [9]. Failure to identify the gland and the unintentional removal of it rather than a fatty hernia can lead to severe dry eye [29]. These data highlight the importance of proper preoperative and intraoperative assessment in addition to the use of an appropriate surgical technique to avoid complications and ensure both aesthetic and functional surgical outcomes. Furthermore, in cases of gland prolapse after surgery, securing the gland with fine sutures to the periosteum is crucial to prevent future displacement [4]. In summary, ensuring a proper technique and management during surgery can reduce the risks associated with lacrimal gland damage as well as contribute to functional and aesthetic success after surgery [9].

Asymmetric eyelid crease

Asymmetry of the eyelid crease after blepharoplasty is an important post-operative complication that can occur in the early stages of recovery. Given that natural facial symmetry is rare, patients often have exaggerated expectations of achieving perfect symmetry after surgery. Thus, it is important to inform the patient before surgery that complete symmetry may not be achievable and that some degree of asymmetry is always possible [3]. The leading causes of asymmetry after surgery include inadequate intraoperative markings, ptosis not diagnosed before surgery, differences in eye protrusion and thyroid disorders affecting the eyelid structures [3].

Advanced methods of supporting the lower eyelids, such as lateral canthal fixation, preventive canthopexy or canthoplasty, used during lower eyelid blepharoplasty, effectively minimise the risk of asymmetry [30]. Reliable preoperative preparation, which includes accurate measurements and analysis of preoperative photographs, is crucial to prevent asymmetry [31,32]. However, if it occurs, there are various options for correction. For example, when the eyelid crease is too low, it is possible to make an incision above and fix it at a higher level. Conversely, if the crease is too high, it is recommended to make an incision at a lower level and use free fat beads to prevent it from attaching at too high a level [31,32]. Incorporating the aforementioned techniques into perioperative and operative procedures is important to minimize complications and increase patient satisfaction with the outcome of the procedure, the effects of which have both aesthetic as well as functional significance. It is also worth mentioning the necessity of photographic documentation both before any operation that alters the patient's appearance and in the event of abnormal healing symptoms.

Residual excess skin

Residual excess skin after blepharoplasty is a significant clinical problem resulting from postoperative asymmetry of the eyelid skin, particularly in the lateral and medial parts of the eyelids. Even despite carefully delineated areas of incision, such complications can occur. Before proceeding with any revision, the surgeon must ensure that sufficient skin remains for re-excision and that the patient does not have symptoms of dry eye or exposure keratopathy. In addition, careful assessment of the position of the eyebrows is crucial. If ptosis is present, it is advisable to restore the eyebrows to their natural anatomical position before deciding to remove the excess skin to avoid aggravating eyebrow sagging [3]. Corrective techniques depend on the amount of excess skin remaining. In situations of moderate excess skin, a 'skin pinching' procedure can be performed after blepharoplasty with volume preservation. In cases of significant skin excess, it may be more effective to lift and excise a flap of skin, particularly to eliminate excess skin extending along the entire length of the lower eyelid [33]. In the context of undercorrection of the upper eyelids, it is better to initially take too little skin rather than too much, as additional skin excision can easily be performed even under local anaesthesia.

It is very important to recognise previously undiagnosed cases of drooping eyebrows before surgery, which can simulate the appearance of excess upper eyelid skin [34]. Patients should be informed before surgery that approximately 5% to 10% of cases may require additional skin removal. In situations where concomitant brow drooping is present, a brow lift should be considered before proceeding with blepharoplasty correction to avoid unnecessary skin removal that could exacerbate brow drooping [35]. In addition, it is recommended to wait a period of at least 6 months after the original surgery before proceeding with any revision to allow the tissue to fully heal and to assess the long-term effects of the correction [3].

Sulcus deformity

Sulcus deformity is among the potential complications of blepharoplasty that can result from the mismanagement of upper eyelid fat tissue. The current surgical techniques favour fat preservation rather than fat resection as a change in approach to eyelid rejuvenation and the pursuit of a natural, youthful appearance. This represents a significant evolution from previous methods, which favoured fat resection and could lead to unaesthetic hollowing of the eyelid sulcus, giving the face an ageing appearance [35]. The upper eyelid contains two major fat pads, the nasal and middle one, which differ in chemical composition and structure, influencing their behaviour during ageing. Ageing causes the nasal fat pad to become more prominent, while the middle fat pad undergoes atrophy. This change in volume can contribute to deformation of the eyelid sulcus, which is visible as a depression on the eyelid. Therefore, it is necessary to prevent loss of periorbital volume [3]. Anatomical differences in the eyelid crease between patients require detailed consideration during surgical planning. It is important to discuss the anatomical features of the eyelid fold and the expected changes after surgery with the patient before the operation, as this is crucial to avoid complications such as repositioning of the eyelid fold or its obliteration [4]. In the surgical context, it is therefore necessary to avoid excessive fat resection in order not to result in unaesthetic hollowing. Instead, minimal sculpting of the nasal fat pad and strategic repositioning or fat grafting can be employed to restore symmetry and volume to the upper eyelid [3,35]. In addition, surgical and non-surgical revision options should be considered depending on the patient's individual expectations and aesthetic goals. For example, the use of hyaluronic acid fillers and manipulation of eyebrow position can correct minor irregularities and asymmetries that may occur after surgery [34]. In summary, a pivotal aspect of blepharoplasty is the prerequisite of not only a precise understanding of the functional internal anatomy, but also a thorough understanding of the delicate external structures. In turn, a detailed pre-operative consultation is crucial to establish realistic expectations of the patient and to ensure that the results of the operation are in line with the patient's aesthetic preferences [34].

Canthal webbing

As a complication of blepharoplasty, canthal webbing can occur on either side of the eyelid crease. Medially, it occurs when the incision line is too close to the edge of the eyelid, is at an abnormal angle, extends too far from the nasal direction, or too large a flap of skin has been excised [3]. It occurs laterally when the incision line of the upper eyelid extends below the lateral angle of the eyelid crevice or excess skin has been removed [36]. In both cases, the scar pulls flaccid skin from the upper and lower eyelids during the healing process, creating a skin bridge. This complication is difficult to remove and can generate further complications. When fixing canthal webbing, it is necessary to wait 6 months to a year after surgery for the wound to fully heal [3]. It should also be remembered that simple excision of the eyelid fold will not improve the situation and may even worsen it. The best method for skin transposition is the Z-plasty technique [36].

Burns

In lower and upper eyelid procedures, the main focus is placed on a surgical technique that spares the fat pads [37]. This is achieved by various methods, including the use of cauterization, which involves a thermal effect that can burn the periorbital area [3,38]. To reduce the risk of burns to a minimum, it is recommended to use bipolar cauterization, which allows more precise delivery of energy and heat than monopolar cauterization [38]. The technique of cutting with short, intermittent cuts is preferred over long, high-energy cuts. Covering the oxygen cannula with a surgical drape should also be avoided as an oxygen trap can result [3].

CONCLUSIONS

Blepharoplasty, despite being one of the most commonly performed plastic surgery procedures in the world is not the easiest of procedures to perform. It is associated with a number of complications, which can have a major impact on the end result of the operation or even on the patient's quality of life. Knowledge of all the complications and how to prevent them is crucial for any eyelid surgeon who wants to achieve good postoperative results.

Conflict of interest

The authors have no potential conflicts of interest to declare.

Ethics approval

Due to the nature of the research, the consent of the ethics committee was not required.

Authors' contribution

Study design – S. Kowalczyk, M. Guzikowski, M. Kokoszka, S. Sirek, D. Wyględowska-Promieńska
Data collection – S. Kowalczyk, M. Guzikowski, M. Kokoszka
Manuscript preparation – S. Kowalczyk, M. Guzikowski, M. Kokoszka, S. Sirek
Literature research – S. Kowalczyk, M. Guzikowski, M. Kokoszka, D. Wyględowska-Promieńska
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