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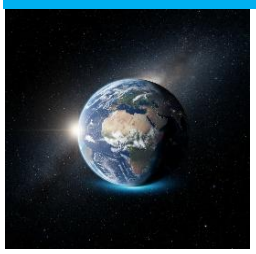

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Eye Injuries in Combat Sports — Literature Review

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Abstract

Background: Eye injuries are a significant cause of morbidity and can lead to permanent visual impairment, particularly in young, physically active individuals engaged in combat sports, where deliberate strikes to the head and face, close physical contact, and full-contact rules create a high-risk environment for ocular trauma (Akanno et al., 2025; Doherty et al., 2025; Zachovajevas et al., 2025).

Aim: To review and synthesize current evidence on the epidemiology, mechanisms, and risk factors of combat-related ocular trauma, and to discuss prevention strategies.

Materials and Methods: A narrative review with elements of a systematic search was conducted in PubMed (2000–2026), focusing on full-contact and mixed combat disciplines. Priority was given to large epidemiological studies and systematic reviews on MMA and boxing injuries. Additional data were drawn from population-based analyses of sports-related eye injuries, retinal screening studies in collision sports, and studies on combat ocular trauma.

Results: In professional boxing and MMA, eye injuries accounted for roughly one-third of all injuries—predominantly eyebrow/eyelid lacerations, orbital hematomas, and corneal abrasions—and in boxing, eye injuries were associated with higher loss rates. Systematic reviews of MMA indicate that 66.8–78% of injuries involve the head, frequently the orbital-eyelid region. Population studies confirm that collision and combat sports are major sources of sports-related eye trauma in young males.

Conclusions: Eye injuries in combat sports are frequent, clinically significant, and likely underreported. Integrating IOC-recommended ophthalmic screening and standardized surveillance with rule and equipment modifications, athlete education, and prompt specialist management—informed in part by experience from collision sports and combat ocular trauma—offers a rational framework for reducing visual morbidity in this population.

Keywords: combat sports; eye injuries; ocular trauma; boxing; mixed martial arts; epidemiology; prevention; retinal lesions; combat ocular trauma.

Introduction

Eye injuries are a significant cause of morbidity and can lead to permanent visual impairment, particularly in young, physically active individuals. In combat sports, deliberate strikes to the head and face, close physical contact, and the full-contact nature of competition create an especially high-risk environment. The growing popularity of these disciplines further increases the clinical and organizational importance of injuries to the visual system. Epidemiological data indicate that in combat sports, head and facial injuries predominate, with the most common injuries involving soft-tissue damage to the orbital region and eyelids (Akanno et al., 2025; Doherty et al., 2025; Zachovajevas et al., 2025). In an analysis of professional boxing and MMA bouts in Texas, ophthalmic injuries accounted for approximately one-third of all injuries, with an incidence of 9.7 per 100 bouts in boxing and 12.2 per 100 bouts in MMA. The most frequently observed injuries were eyebrow lacerations and orbital hematomas; in boxing, the presence of an eye injury was significantly associated with losing the bout (Akanno et al., 2025). Eye and periocular injuries also constitute a substantial proportion of all craniofacial injuries in boxing (Bianco et al., 2005). Systematic reviews and meta-analyses of MMA injuries, following the introduction of unified rules, confirm that the head and neck are the most frequently injured body regions, with superficial soft-tissue damage (abrasions, lacerations, contusions) predominantly in the orbital-ocular region (Eliason et al., 2023; Doherty et al., 2025; Maas et al., 2022; Jensen et al., 2016). From a sports medicine perspective, ophthalmic problems in athletes encompass both acute injuries of the eyeball and orbit and their long-term complications. Contact and collision sports, including combat sports, are among the disciplines with the highest risk of vision-threatening injuries (Turnagöl et al., 2021). Athletes in collision

sports are also more likely to present with asymptomatic peripheral retinal changes, which may increase the risk of severe complications following a subsequent injury (Ciaccioni et al., 2023). Reports from emergency departments and ophthalmic centers indicate that sports injuries account for a substantial proportion of acute eye trauma and can lead to significant deterioration of visual acuity, particularly in settings with limited access to specialist care (Zachovajevas et al., 2025; Liaghat et al., 2022; Keogh & Winwood, 2017). Evidence from military medicine demonstrates that reducing the time to primary reconstruction of severe globe injuries improves functional outcomes and reduces the risk of enucleation—a finding that may serve as an important reference point for the management of severe sports-related injuries (Bianco et al., 2005; Bickley et al., 2023; Jurczyk-Florkiewicz et al., 2026). Given the growing popularity of combat sports and the increasingly well-documented burden of head and craniofacial injuries, a comprehensive review of the available literature on eye injuries in this group of disciplines is warranted. The aim of this paper is to review and synthesize data on the epidemiology, mechanisms, and clinical presentation of eye injuries in combat sports, their impact on sports outcomes and visual prognosis, and strategies for prevention and optimization of medical care for athletes.

Materials and Methods

This article was designed as a narrative review with elements of a systematic literature search on sports-related eye injuries in combat sports and the impact of safety procedures on their incidence. The review focused on the epidemiology, mechanisms, risk factors, and prevention of ocular trauma in full-contact and mixed combat disciplines. A structured literature search was conducted primarily in PubMed, covering publications from 1 January 2000 to 31 December 2026, limited to peer-reviewed articles. Reference lists of key original studies, systematic reviews, and consensus documents were manually screened to identify additional relevant publications. Titles and abstracts were independently screened for relevance according to predefined eligibility criteria (combat sports or full-contact disciplines; outcomes including ocular or periocular injury; human studies; English-language publications). Full texts of potentially eligible articles were then assessed to confirm inclusion. Particular emphasis was placed on large epidemiological studies, systematic reviews, and consensus papers reporting the incidence, mechanisms, and prevention of sports-related ocular injuries in combat sports. Data from the included studies were synthesized narratively and grouped into thematic domains: epidemiology of ocular trauma in combat sports, mechanisms and risk factors, types and severity of injuries, and preventive strategies, including rules, equipment, and medical supervision. On this basis, an interdisciplinary prevention framework was developed, integrating medical, organizational, and educational components. As this review was based exclusively on previously published, anonymized data, formal ethical approval and informed consent were not required.

Artificial intelligence (AI) was used in this study for two main purposes: to support the analysis of clinical reasoning narratives by identifying recurring linguistic patterns, and to assist in improving the academic English of the manuscript to ensure clarity, coherence, and adherence to scientific writing conventions. AI tools were also used for additional language refinement, including improvements to grammar, style, and the presentation of results.

All AI applications were employed strictly as supportive instruments under direct human supervision. The interpretation of findings, classification of errors, and development of

conclusions were performed exclusively by human experts in clinical medicine and formal logic. While AI enhanced efficiency in data processing, pattern recognition, and language editing, it did not replace human judgment at any stage of the research or analytical process.

Mechanism

In collision and combat sports, the dominant mechanisms of ocular injury are direct blows to the periorbital region or the eyeball by the opponent's body, while rapid changes of direction, jumps, and landings contribute to head and facial injuries that can secondarily involve ocular structures (Arej et al., 2025; Stepper et al., 2025; Sundberg et al., 2025; Haring et al., 2016). Beyond isolated eye trauma, blows to the head and concussions share partially overlapping mechanisms—especially in contact and collision sports—in which rule-permitted physical contact, charging, and heading increase exposure to impulsive forces that may also threaten the integrity of the orbit and retina (Eliason et al., 2023; Patricios et al., 2023; Abrahams et al., 2013; Sundberg et al., 2025). The main direct mechanisms include punches, elbows, knees, and kicks to the orbital region, leading to contusions and hematomas of the eyelids, periocular tissues, and orbit, as well as subconjunctival hemorrhages, hyphema, and orbital wall fractures (Akanno et al., 2025; Jensen et al., 2016; Ross et al., 2021; Follmer et al., 2019). The "eye poke"—accidental insertion of a finger or fingernail into the eye in MMA—causes corneal abrasions, superficial erosions, and post-traumatic eye pain (Akanno et al., 2025). Repeated blows to the upper face in boxing, with frequent punch combinations to the head, increase the risk of orbital and globe injury and correlate with losing the bout by impairing vision, defense, and reaction time (Akanno et al., 2025; Jensen et al., 2016; Ross et al., 2021). Head acceleration-deceleration forces during knockouts (KO/TKO) and knockdowns generate shearing forces within the retina and choroid, promoting asymptomatic peripheral changes (degenerations, tears, detachments) observed more frequently in collision-sport athletes, including boxers (Zachovajevas et al., 2025; Arej et al., 2025). Head concussions and microtraumas from repeated blows—even in the absence of overt concussion—can lead to vascular-retinal changes and oculomotor dysfunction (impaired saccades, smooth pursuit, and gaze stabilization) (Ciaccioni et al., 2023; Chmiel & Nadobnik, 2025; Brown & Gross, 2024; Follmer et al., 2019). Chokes and strangulations (e.g., rear-naked choke, guillotine) cause short-term, high pressure in the neck and jugular veins, which may transiently increase intracranial and orbital venous pressure, potentially exacerbating conjunctival and periorbital hemorrhages (Mańka-Malara & Trzaskowski, 2025; Jensen et al., 2016; Follmer et al., 2019). Falls and throws (as in judo/wrestling within MMA) can cause orbital injuries and transmit mechanical forces to the posterior pole of the globe (producing retinal changes) even in the absence of a direct blow to the eye (Ciaccioni et al., 2023; Kiehl et al., 2025; Arej et al., 2025).

Risk Factors

Discipline-specific and bout-related factors play a key role in the etiology of orbital injuries in combat sports. Disciplines with a predominance of head striking—such as boxing, MMA, kickboxing, or Muay Thai—are associated with a high proportion of head and facial injuries, including the orbital region (Akanno et al., 2025; Jensen et al., 2016; Ross et al., 2021). The technique profile is also relevant: frequent head punches in boxing, elbow and knee strikes in Muay Thai and MMA, and the possibility of accidental finger-eye contact ("eye poke" in MMA) all increase the risk of globe and orbital injuries (Akanno et al., 2025; Doherty et al., 2025;

Zachovajevas et al., 2025). In addition, full-contact formats—in which a high proportion of bouts end by KO/TKO—involve a large number of powerful head blows, which are strong predictors of overall head and facial injuries (Zachovajevas et al., 2025; Hutchison et al., 2014; Lockwood et al., 2018). Athlete-related factors and exposure also matter. Losing fighters sustain several times more injuries than winners; in boxing and MMA, defeat—especially by KO/TKO—significantly increases the risk of orbital injuries (Curran-Sills & Abedin, 2018; Ross et al., 2021). Higher injury rates are observed in professional compared with amateur athletes, and frequent competition and long careers in sports with a high proportion of head injuries favor the accumulation of damage along the eye-brain axis (Zachovajevas et al., 2025; Jensen et al., 2016; Hutchison et al., 2014; Lockwood et al., 2018). Furthermore, older age and participation in heavier weight classes are associated with a higher rate of KO/TKO outcomes, which is indirectly linked to an increased risk of severe head and orbital trauma (Zachovajevas et al., 2025; Hutchison et al., 2014). Systemic and protective factors are equally important. In many professional MMA and boxing formats, no equipment directly protects the orbital region, and standard gloves do not prevent globe trauma or eye-poke incidents (Akanno et al., 2025; Zachovajevas et al., 2025; Bromley et al., 2017). Moreover, incomplete injury reporting—limiting documentation to severe injuries and failing to record all cases—hinders the identification of true risk factors and the implementation of effective preventive measures (Doherty et al., 2025; Zachovajevas et al., 2025; Turnagöl et al., 2021).

Table 1: Key risk factors in combat sports.

Risk factor category	Example / description	Possible ocular effect
Fighting style	Boxing, MMA — numerous head punches	Orbital contusions, hematomas
Bout outcome	Loss, especially by KO/TKO	More severe head/eye injuries
Weight class / age	Heavier classes, older athletes	More knockouts, cumulative trauma
Rules and equipment	No eye shields, open-finger gloves	Eye poke, corneal/globe injuries

Sources: Doherty et al., 2025; Zachovajevas et al., 2025; Turnagöl et al., 2021; Akanno et al., 2025; Bromley et al., 2017

Epidemiology

Eye injuries in combat sports fall within the broader problem of head and facial trauma, which represents the most common injury location in striking sports. In combat sports—especially full-contact disciplines such as MMA, boxing, or Muay Thai—the head and face account for 29.5–75.9% of all injuries, with a predominance of soft-tissue damage (abrasions, contusions, lacerations) and facial fractures (Akanno et al., 2025; Bineshfar et al., 2025; McCrindle et al., 2017; Turnagöl et al., 2021). In recent years, the number of studies describing the frequency, pattern, and risk factors of injuries in MMA, boxing, Muay Thai, and other combat sports has grown, yet the detailed epidemiology of ocular injuries remains relatively poorly characterized (Akanno et al., 2025; Bineshfar et al., 2025; Moe et al., 2023). In a retrospective study conducted in Texas, the incidence of ophthalmic injuries in professional boxing and MMA was 9.7 and 12.2 injuries per 100 bouts, respectively, with MMA showing greater diversity of injury types (Akanno et al., 2025). Data from the Nevada State Athletic Commission indicate that

approximately 14% of all boxing injuries involved the eye region (Akanno et al., 2025). Overall, ophthalmic injuries accounted for 28% of all injuries in the analyzed MMA bouts, predominantly eyebrow and eyelid lacerations, eyelid and orbital hematomas, and corneal abrasions (Akanno et al., 2025). Meta-analyses of MMA injury epidemiology confirm that 66.8–78% of injuries are located in the head region, with a predominance of lacerations and abrasions in the orbital-eyelid area and frequent orbital fractures (Bineshfar et al., 2025; Lee et al., 2025; Kamil et al., 2025; McCrindle et al., 2017). The IOC consensus emphasizes that in contact sports, eye injuries range from superficial conjunctival and corneal abrasions to serious posterior segment damage, such as vitreous hemorrhage or retinal detachment, and are particularly common in collision and combat sports (Moe et al., 2023; Jurczyk-Florkiewicz et al., 2026). Population-based data from the United States show that collision sports (including combat sports) are a significant source of eye trauma, with peak incidence among young men (Haring et al., 2016; Matsa et al., 2018). Compared with grappling disciplines (judo, wrestling), the proportion of head and facial injuries—including the orbital region—is significantly higher in boxing and other striking sports (Turnagöl et al., 2021; Moe et al., 2023; Jurczyk-Florkiewicz et al., 2026). At the population level, sports injuries account for tens of thousands of emergency department visits annually, with collision and combat sports representing a substantial share of all acute eye injuries, particularly among young, physically active men (Haring et al., 2016; Matsa et al., 2018; Barr et al., 2000; Jurczyk-Florkiewicz et al., 2026).

Prevention

Protective equipment, rule modifications, systematic screening, and organized training and post-injury management form complementary levels of prevention for eye injuries in combat sports. The IOC consensus highlights the key role of properly selected eye and orbital protection—goggles, face shields, and helmets with visors—in sports with high ophthalmic risk, including boxing, wrestling, and judo (Moe et al., 2023). In MMA, it is also essential to design gloves and enforce rules in a way that minimizes accidental finger-eye contact (“eye poke”), drawing on experience from other contact sports and on the role of rule changes in reducing head injuries (Eliason et al., 2023; Bahr et al., 2020). One example of the effectiveness of rule modification is the ban on body-checking in youth ice hockey, which significantly reduced concussion rates; analogously, in combat sports one may consider shortening round duration, limiting the number of strikes absorbed, and promptly stopping bouts when eye injury is suspected (Eliason et al., 2023; Bahr et al., 2020; Turnagöl et al., 2021). The second pillar is screening and monitoring. The IOC recommends periodic ophthalmic examinations in high-risk athletes, including assessment of visual acuity and ocular structures, with baseline documentation and follow-up after injuries (Moe et al., 2023). In collision sports, retinal screening for asymptomatic peripheral lesions—which may require special protection or reduced exposure to head trauma—is particularly important (Patricios et al., 2023; Moe et al., 2023). Implementation of IOC recommendations on standardized injury surveillance (e.g., STROBE-SIIS) enables better identification of ocular injury patterns in combat sports and facilitates assessment of preventive measures (Bahr et al., 2020). The third area is education, technique, and training organization. The IOC consensus emphasizes awareness of eye-injury symptoms (pain, visual disturbances, flashes, floaters) and the necessity of immediate cessation of activity and urgent medical evaluation (Moe et al., 2023). Similar to the lower incidence of head injuries in taekwondo athletes who employ effective blocking techniques, in combat sports a focus on evasive movements, blocking, and distance control may reduce the number of blows to the orbital region (Eliason et al., 2023). Evidence from other contact sports, where reduced contact in practice sessions has been associated with fewer concussions, supports limiting the

number of full-force sparring sessions in favor of technical training (Eliason et al., 2023; McCrory et al., 2017). The fourth key element is post-injury management and return-to-competition decisions. Data from war-related eye injuries demonstrate that shorter time to surgical intervention improves visual prognosis; in combat sports, this translates into the need for immediate referral to an ophthalmic center when a severe injury is suspected (Akanno et al., 2025; Mountjoy et al., 2023). After more serious injuries (e.g., retinal detachment, open globe injuries), an individualized return-to-fighting or career-termination decision is required, made jointly by an ophthalmologist and a sports medicine physician in accordance with IOC recommendations and general return-to-play principles (Moe et al., 2023; Patricios et al., 2023).

Discussion

Available studies confirm that combat sports carry a high risk of head and facial injuries, yet specific globe and orbital injuries have so far been described only fragmentarily (Akanno et al., 2025; Turnagöl et al., 2021; Forsdyke et al., 2016; Lovalekar et al., 2021). The work by Akanno et al. partially addresses this gap but simultaneously reveals the limitations of current ophthalmic injury surveillance in combat sports (Akanno et al., 2025). Systematic reviews of MMA show a very high overall injury rate dominated by head and facial trauma, without precise separation of ocular structures (Turnagöl et al., 2021; Bahr et al., 2020; Doherty et al., 2025; Jurczyk-Florkiewicz et al., 2026). Similarly, in boxing most studies focus on brain and skin injuries, and the proportion of eye injuries is reported only in general terms (Lovalekar et al., 2021). Against this background, the analysis by Akanno et al. shows that in boxing nearly 40% of all recorded injuries are in the eye region, and in MMA almost 30%, with greater diversity of injury types in MMA (including eye poke, pupil injuries, and orbital hematomas) (Akanno et al., 2025). This suggests that the importance of ophthalmic injuries in combat sports has likely been underestimated in earlier, more general injury studies (Turnagöl et al., 2021; Bahr et al., 2020; Forsdyke et al., 2016). A notable finding by Akanno et al. is the significant association between eye injury and losing the bout in boxing, which was not demonstrated in MMA (Akanno et al., 2025); this may reflect differences in fighting techniques and bout-stopping criteria, while other MMA analyses confirm only a correlation between bout outcome and the number and severity of head injuries, without distinguishing globe injuries (Turnagöl et al., 2021; Doherty et al., 2025; Forsdyke et al., 2016). Population studies on sports-related eye trauma show that contact sports are an important source of severe ophthalmic injuries, many of which are potentially preventable with appropriate protective measures (Lovalekar et al., 2021; Ciaccioni et al., 2023). The IOC consensus on ophthalmic issues in sport underscores that the eyes are among the most exposed yet least protected organs in elite sport, and stresses the need for systematic injury monitoring using STROBE-SIIS standards, inclusion of ophthalmic examinations in periodic assessments, and special vigilance in collision disciplines and in athletes with predisposing retinal changes (Eliason et al., 2023; Maas et al., 2022; Bahr et al., 2020). Eye injuries in combat sports should therefore be viewed within the broader continuum of ophthalmic trauma documented in armed conflicts and civilian settings, where military data clearly indicate that time to intervention and appropriate management determine visual prognosis in severe globe injuries (Lystad et al., 2014; Matsa et al., 2018). Even in the absence of overt eye trauma, combat-sport athletes exhibit vestibulo-oculomotor dysfunctions linked to repeated head impacts (Green et al., 2020; Jurczyk-Florkiewicz et al., 2026). Combined with the high incidence of concussions and brain injuries in MMA and boxing, this suggests that globe injuries form part of a complex spectrum of head-eye trauma (Turnagöl et al., 2021; Doherty et al., 2025; Zungu et al., 2021). Additionally, isolated case reports—such as herpes gladiatorum with ocular involvement in an MMA athlete—highlight the infectious

complications of close skin-to-skin contact. Most available studies are retrospective and based on medical records or ringside reports, which favors under-reporting of milder injuries, including superficial corneal damage and transient visual disturbances (Akanno et al., 2025; Turnagöl et al., 2021; Forsdyke et al., 2016; James et al., 2016). The lack of standardized definitions of eye injuries and their severity hampers comparisons across disciplines and countries (Eliason et al., 2023; Bahr et al., 2020), and the small number of studies devoted exclusively to ophthalmic trauma in combat sports—together with the absence of prospective research involving full ophthalmic examination before and after bouts—precludes reliable estimation of the true incidence of retinal microtrauma or minor hemorrhages (Akanno et al., 2025; Maas et al., 2022). It also remains unknown to what extent current rules (Unified Rules of MMA, changes in Olympic boxing) alter the pattern and severity of ophthalmic injuries, since existing reviews have focused mainly on overall injury rates and concussions (Turnagöl et al., 2021; Bahr et al., 2020; Zungu et al., 2021), and long-term data on ophthalmic consequences—such as retinal detachment or chronic binocular vision disorders in former athletes—are lacking. Synthesizing findings from combat-sport-specific studies with the IOC consensus and experience from other fields (collision sports, war injuries) points to several priorities: inclusion of a detailed "ocular/ophthalmological" category in all injury surveillance systems in MMA, boxing, and Muay Thai, ideally in line with STROBE-SIIS (Eliason et al., 2023; Bahr et al., 2020; James et al., 2016); design of prospective studies involving ophthalmologists and full pre- and post-bout examinations to assess the incidence of minor but potentially cumulative eye injuries (Akanno et al., 2025; Maas et al., 2022); evaluation of the impact of rule changes (sanctions for eye poke, glove design modifications, quicker stoppages when eye injury is suspected) on the frequency and severity of ophthalmic trauma (Akanno et al., 2025; Turnagöl et al., 2021; Doherty et al., 2025); and analysis of long-term ophthalmic and neurological consequences after years of exposure to head and eye trauma, using functional tools such as vestibulo-oculomotor tests and EEG (Green et al., 2020; Fares et al., 2025; Zungu et al., 2021).

Conclusion

Based on the available literature, the following conclusions can be drawn regarding eye injuries in combat sports. Eye-region injuries are frequent and clinically important: in boxing and MMA they account for approximately 38% and 28% of all injuries, respectively, with an incidence of 9.7–12.2 per 100 bouts and a predominance of eyelid and eyebrow lacerations and orbital hematomas (Akanno et al., 2025). General sports data confirm that eye trauma is a major health problem in young, active individuals (Brown & Gross, 2024; Haring et al., 2016). The pattern and consequences of injuries differ between disciplines: MMA is characterized by greater diversity of injury types (including eye poke, pupil injuries, and orbital hematomas) than boxing, reflecting the mixed nature of its techniques (striking plus grappling) (Akanno et al., 2025; Doherty et al., 2025; Forsdyke et al., 2016). In boxing, eye injury significantly increases the risk of losing the bout, an association not observed in MMA (Akanno et al., 2025). The risk of ophthalmic complications is substantial, and prognosis depends strongly on the organization of care: globe injuries are among the leading causes of unilateral blindness, and reducing the time to surgical treatment significantly improves visual outcomes (Hutchison et al., 2014; Haring et al., 2016; Zachovajevas et al., 2025). Current injury-monitoring systems, however, underestimate the ophthalmic burden—most studies in MMA, Muay Thai, and boxing focus on head and musculoskeletal injuries and rarely include detailed ophthalmic categories (Doherty et al., 2025; Eliason et al., 2023; Chmiel & Nadobnik, 2025; Lovalekar et al., 2021). IOC recommendations and STROBE-SIIS guidelines underscore the need to standardize the

recording of eye injuries as a distinct entity (Ciaccioni et al., 2023; Bahr et al., 2020). Prospective, targeted ophthalmic studies—including routine retinal assessment before and after bouts and long-term follow-up of eye injuries and coexisting head trauma—are therefore necessary (Akanno et al., 2025; Ciaccioni et al., 2023; Bahr et al., 2020; Mandorino et al., 2022).

Disclosure

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