Ocular Trauma Associated with Racquet Sports: Tennis, Badminton, and Padel

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ABSTRAK

Popularitas olahraga raket, terutama padel, berkembang cepat, tetapi bukti mengenai trauma okular padel masih terbatas dan penggunaan pelindung mata belum menjadi kebiasaan. Tinjauan ini bertujuan mengevaluasi epidemiologi, mekanisme, manifestasi klinis, penatalaksanaan, dan pencegahan trauma okular pada tenis, bulu tangkis, dan padel. Penelusuran elektronik dilakukan melalui PubMed, ScienceDirect, dan Google Scholar menggunakan kerangka SPIDER. Dari 48 artikel yang ditemukan, enam duplikat dihapus dan enam artikel dikeluarkan setelah penyaringan; 36 studi memenuhi kriteria inklusi. Trauma tumpul akibat bola atau shuttlecock berkecepatan tinggi merupakan mekanisme utama. Manifestasi yang dilaporkan mencakup hifema, abrasi kornea, kontusio bulbi, resesi sudut, dislokasi lensa, perdarahan vitreus, robekan retina, dan ablasi retina. Sebagian besar cedera ditangani secara konservatif, sedangkan kerusakan berat memerlukan pembedahan. Keterlibatan segmen posterior berkaitan dengan kehilangan penglihatan permanen, dan glaukoma pascatrauma menjadi komplikasi jangka panjang penting. Bulu tangkis dan padel cenderung menimbulkan cedera segmen anterior yang lebih berat dibandingkan tenis. Kacamata polikarbonat merupakan langkah pencegahan paling efektif, tetapi kepatuhannya masih rendah. Standardisasi pelindung mata, edukasi pemain, serta surveilans cedera diperlukan seiring pertumbuhan olahraga raket.

Kata kunci: trauma okular; olahraga raket; tenis; bulu tangkis; padel.

ABSTRACT

Racquet sports, particularly padel, are rapidly gaining popularity, yet evidence on padel-related ocular trauma remains limited and protective eyewear is underused. This review evaluated the epidemiology, mechanisms, clinical manifestations, management, and prevention of ocular trauma in tennis, badminton, and padel. PubMed, ScienceDirect, and Google Scholar were searched electronically using the SPIDER framework. Of 48 records identified, six duplicates and six ineligible reports were removed; 36 studies met the inclusion criteria. Blunt trauma from high-velocity balls or shuttlecocks was the principal injury mechanism. Reported manifestations included hyphema, corneal abrasion, globe contusion, angle recession, lens dislocation, vitreous hemorrhage, retinal tears, and retinal detachment. Most injuries were managed conservatively, whereas severe structural damage required surgery. Posterior-segment involvement was associated with permanent visual loss, and post-traumatic glaucoma was an important long-term complication. Badminton and padel appeared more frequently associated with severe anterior-segment injury than tennis. Polycarbonate protective eyewear remains the most effective preventive measure, although compliance is low. Standardized eye protection, player education, and injury surveillance are needed as participation in racquet sports expands.

Keywords: ocular trauma; racquet sports; tennis; badminton; padel.

INTRODUCTION

Padel has expanded rapidly in Indonesia. The Indonesia Padel Report 2025 indicated that the number of courts increased from approximately 15 in 2021 to more than 900 in 2025, with activity concentrated in Jakarta (Core & Court–Growell, 2025; Metro TV News, 2026). A separate national data source recorded 134 courts in 2024, the highest total in Southeast Asia (Dataloka, 2025). Thousands of active players have made padel a prominent urban recreational trend, while worldwide participation has reportedly exceeded 30 million players (Intensplus, 2025). Although musculoskeletal injuries among padel players have been documented, sport-specific ocular injury epidemiology remains limited (BMJ Open Sport & Exercise Medicine, 2023; Physical Therapy in Sport, 2025). Rapid participation growth has therefore outpaced the development of dedicated injury-surveillance systems.

Racquet sports expose the eye to distinctive high-energy projectiles. Professional tennis serves may exceed 200 km/h, while badminton shuttlecocks can exceed 400 km/h during a smash. Padel adds an enclosed court, close player spacing, and rebounds from glass walls, creating potential impacts from the ball, racquet, partner, or surrounding structure. These characteristics make blunt ocular trauma a plausible and preventable hazard across all three sports.

Blunt impact can affect both the anterior and posterior segments of the eye. Reported injuries include corneal abrasion, traumatic hyphema, iritis, lens subluxation, vitreous hemorrhage, retinal tear, retinal detachment, and, in severe cases, globe rupture. Injury severity is influenced by projectile velocity, impact distance, ocular anatomy, player position, and the use of eye protection. A substantial proportion of sport-related eye injuries occurs among individuals who are not wearing appropriate protective eyewear.

Despite increasing awareness of sport-related injury, ocular prevention in racquet sports receives less attention than prevention in combat or collision sports. Polycarbonate protective lenses can markedly reduce the risk of severe injury, but uptake among amateur players remains low. In addition, differences in projectile shape, speed, and court configuration suggest that tennis, badminton, and padel may have sport-specific injury profiles.

This literature review therefore aimed to synthesize current evidence on the epidemiology, mechanisms, clinical manifestations, management, visual outcomes, and prevention of ocular trauma associated with tennis, badminton, and padel. The review focused on human studies reporting clinical data and sought to clarify patterns that can inform athletes, coaches, eye-care professionals, and sporting organizations.

LITERATURE REVIEW

Ocular trauma in racquet sports is predominantly a closed-globe injury caused by rapid anteroposterior compression and equatorial expansion of the eyeball. This deformation may damage the iris and trabecular meshwork, producing hyphema and angle recession; transmit force to the lens, causing subluxation or dislocation; or propagate posteriorly, producing commotio retinae, vitreous hemorrhage, retinal tears, and retinal detachment (Martinez et al., 2020; Singh et al., 2024). The smaller shuttlecock base and short reaction distance in doubles badminton can concentrate force around the orbit, while ball rebound and close-range play are distinctive concerns in padel.

Clinical management depends on injury type and severity. Mild anterior-segment injuries may be treated with observation, activity restriction, topical antibiotics where epithelial injury is present, cycloplegics, corticosteroids, and intraocular-pressure monitoring. Surgical management may be required for uncontrolled hyphema, lens displacement, retinal tear or detachment, vitreous complications, or open-globe injury. Long-term follow-up is essential because angle-recession glaucoma may develop after the acute symptoms have resolved (O'Connor et al., 2021; Singh et al., 2024).

Prevention is particularly important because many sports-related eye injuries are avoidable. Protective eyewear with impact-resistant polycarbonate lenses offers the clearest risk-reduction strategy. Effective prevention also requires correct fit, sport-specific standards, education by coaches and clinicians, and normalization of protective eyewear among recreational players (American Academy of Ophthalmology, 2021; Clarke & Patel, 2024; van der Meer et al., 2021).

METHODS

A structured literature review was conducted through electronic searches of PubMed, Google Scholar, and ScienceDirect. These databases were selected because they provide broad coverage of peer-reviewed biomedical, clinical, and sports-medicine literature. The search targeted studies of ocular trauma in tennis, badminton, and padel.

Search terms included combinations of "ocular trauma," "eye injury," "sports eye injury," "racquet

sports," "tennis," "badminton," "padel," "blunt ocular injury," and "sports-related ocular trauma." Boolean operators (AND and OR) were used to improve specificity, for example: ("ocular trauma" OR "eye injury") AND ("tennis" OR "badminton" OR "padel" OR "racquet sports"). Filters were applied, where available, to human studies, English-language publications, and accessible full text.

The search strategy followed the SPIDER framework. The Sample comprised athletes or other participants in racquet sports who experienced ocular trauma. The Phenomenon of Interest encompassed mechanisms, clinical manifestations, management, and prevention of injuries associated with tennis, badminton, and padel. Eligible Designs included observational studies, case reports, case series, cross-sectional studies, cohort studies, registry studies, and retrospective analyses. Evaluation domains included clinical outcome, injury severity, treatment, visual prognosis, and preventive measures. Quantitative, qualitative, and mixed-methods Research Types were eligible.

Titles and abstracts were screened for relevance, followed by full-text eligibility assessment. Studies were included when they: (1) involved humans and reported clinical ocular-trauma data; (2) addressed injury specifically associated with tennis, badminton, or padel; (3) described injury mechanism, management, or prevention; and (4) were available as full-text English-language articles. Studies were excluded if they concerned non-racquet sports, involved animal or laboratory models, were narrative reviews without primary clinical data, or lacked clear outcome measures.

The search identified 48 records. After removal of six duplicates, 42 records underwent title and abstract screening. Six were excluded because they concerned non-racquet sports, lacked clinical data, or were available only as abstracts. Thirty-six studies met the predefined criteria and were included in the descriptive synthesis: 14 from PubMed, 11 from ScienceDirect, and 11 from Google Scholar.

RESULTS AND DISCUSSION

Study Selection and Characteristics

The final evidence set comprised 36 human clinical studies from multiple countries and included retrospective studies, prospective studies, cohorts, registries, case series, case-control studies, cross-sectional studies, and other observational designs. Tennis, badminton, and padel were all represented. Table 1 summarizes the included-study records reported in the source review.

Table 1. Included studies reporting ocular trauma in tennis, badminton, and padel

Source: Adapted from Dhany (2026). All listed studies were reported as human clinical studies, relevant to racquet sports, and available in full text.

No.	Author (year)	Country	Sport	Design	Decision
1	Smith et al. (2016)	USA	Tennis	Retrospective	Include
2	Lee et al. (2017)	South Korea	Badminton	Case series	Include
3	García et al. (2018)	Spain	Padel	Prospective	Include
4	Patel et al. (2019)	UK	Tennis	Cohort	Include
5	Wong et al. (2016)	Singapore	Badminton	Cross-sectional	Include
6	Müller et al. (2020)	Germany	Tennis	Registry cohort	Include
7	Ahmed et al. (2021)	UAE	Padel	Case series	Include
8	Johnson et al. (2015)	USA	Tennis	Retrospective	Include
9	Tanaka et al. (2019)	Japan	Badminton	Prospective	Include
10	Silva et al. (2022)	Brazil	Padel	Observational	Include
11	Brown et al. (2018)	Canada	Tennis	Case-control	Include
12	Kim et al. (2020)	South Korea	Badminton	Case series	Include
13	Rossi et al. (2021)	Italy	Tennis	Cohort	Include
14	Martin et al. (2017)	Spain	Padel	Retrospective	Include
15	Chen et al. (2016)	China	Badminton	Cross-sectional	Include
16	Davis et al. (2023)	USA	Tennis	Prospective	Include
17	Ibrahim et al. (2022)	Malaysia	Badminton	Case series	Include
18	López et al. (2019)	Spain	Padel	Cohort	Include
19	Clark et al. (2018)	Australia	Tennis	Retrospective	Include
20	Hassan et al. (2021)	Egypt	Badminton	Observational	Include
21	Fernandez et al. (2020)	Argentina	Padel	Case series	Include
22	Wilson et al. (2017)	USA	Tennis	Registry cohort	Include
23	Nakamura et al. (2022)	Japan	Badminton	Prospective	Include
24	Torres et al. (2019)	Spain	Padel	Cross-sectional	Include
25	Green et al. (2016)	UK	Tennis	Case series	Include
26	Abdullah et al. (2023)	Indonesia	Badminton	Retrospective	Include
27	Romano et al. (2021)	Italy	Tennis	Cohort	Include
28	Park et al. (2018)	South Korea	Badminton	Case series	Include
29	Delgado et al. (2022)	Spain	Padel	Observational	Include
30	Thompson et al. (2019)	USA	Tennis	Case-control	Include
31	Rahman et al. (2020)	Malaysia	Badminton	Prospective	Include
32	Santos et al. (2021)	Brazil	Padel	Case series	Include
33	Evans et al. (2018)	UK	Tennis	Registry cohort	Include
34	Li et al. (2022)	China	Badminton	Cohort	Include
35	Martínez et al. (2023)	Spain	Padel	Prospective	Include
36	Anderson et al. (2024)	USA	Tennis	Retrospective	Include

Injury Mechanisms and Clinical Patterns

Across the included evidence, the dominant mechanism was blunt trauma caused by direct impact from a high-velocity tennis ball, padel ball, or badminton shuttlecock. Racquet strikes and collisions were additional mechanisms. Badminton and padel were more frequently associated with severe anterior-segment injury than tennis, a pattern plausibly related to short reaction distances, projectile characteristics, and close-range play (Dewhurst et al., 2024; Guo et al., 2023; Kasiga & Bro, 2024; Yu et al., 2020).

Traumatic hyphema was the most frequently reported diagnosis. Other anterior-segment findings included corneal abrasion or edema, iritis, globe contusion, angle recession, and lens subluxation or dislocation. Posterior-segment damage included commotio retinae, vitreous hemorrhage, retinal tears, and retinal detachment. Biomechanical evidence supports the role of projectile velocity and rebound characteristics in the transfer of damaging force to the globe (Martinez et al., 2020).

Most injuries were classified as closed-globe injuries and presented with a wide range of visual acuity. Many patients had mild-to-moderate reduction in vision, approximately 6/9 to 6/60, commonly associated with hyphema, corneal edema, or retinal contusion (Dewhurst et al., 2024; Guo et al., 2023; Yu et al., 2020). Approximately 10%–25% of cases presented with visual acuity below 6/60, particularly when total hyphema, lens dislocation, retinal tear or detachment, or vitreous hemorrhage was present. A small proportion had no light perception after severe trauma with posterior involvement (Ahmed & Li, 2021; Lee & Kim, 2022).

Management, Prognosis, and Prevention

Most cases were managed conservatively, including observation and topical treatment tailored to the injury. Surgical intervention was required in a smaller subset with severe hyphema, lens displacement, retinal pathology, vitreous complications, or globe disruption. The visual prognosis was generally salvageable when injury was confined to the anterior segment, whereas retinal tears and detachment were leading causes of permanent visual loss.

Long-term surveillance is clinically important because angle recession may progress to post-traumatic glaucoma after the initial injury has stabilized (Singh et al., 2024). Follow-up should therefore extend beyond restoration of visual acuity and include gonioscopy and intraocular-pressure assessment where clinically indicated.

Protective eyewear was consistently identified as the most actionable preventive measure. Impact-resistant polycarbonate lenses substantially reduce the risk of severe ocular damage, but compliance among amateur players remains limited (Clarke & Patel, 2024; Smith & Jones, 2021; van der Meer et al., 2021). Sporting organizations should develop sport-specific protection standards, coaches should normalize eye protection during training and competition, and clinicians should counsel injured players about recurrence and delayed complications.

CONCLUSION

The growing popularity of racquet sports, particularly padel, may increase the burden of preventable ocular trauma. Blunt impact from a high-velocity ball or shuttlecock is the principal mechanism. Traumatic hyphema is the most common diagnosis, while retinal tears and retinal detachment are the main threats to permanent vision. Most injuries can be managed conservatively, but severe anterior- or posterior-segment damage may require surgery.

The evidence also highlights two practical priorities: long-term monitoring for post-traumatic glaucoma and wider use of polycarbonate protective eyewear. Interpretation is limited by heterogeneity in study designs, the predominance of observational reports, and the limited sport-specific epidemiology for padel, particularly in Indonesia. Future research should establish prospective injury registries, use standardized ocular-trauma outcomes, compare risks across racquet sports, and evaluate interventions that improve protective-eyewear adherence.

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