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CASE REPORT
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BELOOKI BLOWOUT PRELOM BEZ SUBKONJUKTIVALNOG KRVARENJA – 10 DANA ODLOŽENA HIRURŠKA INTERVENCIJA I NJEN ISHOD: PRIKAZ SLUČAJA

WHITE-EYED BLOWOUT FRACTURE: A 10 DAYS DELAYED SURGICAL INTERVENTION AND OUTCOMES: A CASE REPORT

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Sažetak

Osnov problema: Povreda kraniomaksilofacijalne regije u pedijatrijskoj populaciji je retka povreda, sa stopom incidencije od 15%, a najčešće se javlja prelom dna orbite. Belooki blowout prelomi mogu biti neinficirani ili inficirani, sa traumom koja je načešća u etiologiji ovog oboljenja.

Metode rada: Prikazan je petnaestogodišnji pacijent sa dijagnozom belooki blowout prelom, koji je lekaru prijavljen deset dana nakon povrede. Prelom je hirurški saniran oslobađanjem zarobljenog donjeg pravog mišića očne jabučice i postavljanjem titanijumske mreže na orbitalni pod, sa postoperativnim periodom praćenja od 6 meseci.

Rezultati: U ovom prikazu slučaja, iako su pokreti oka bili evidentni, bez ikakvih ograničenja, autori nisu uspeali pacijentu da omoguće čitav spektar pokreta oka, zbog odložene hirurške intervencije.

Zaključak: Uklještenje donjeg pravog mišića očne jabučice najčešći je entitet koji se sreće u slučajevima belookog blowout preloma, zbog njegove neposredne blizine sa podom orbite. Rana dijagnoza i brza hirurška intervencija doveli bi do najboljeg pozitivnog ishoda u lečenju belookog blowout preloma.

Ključne reči: trauma u dečjem uzrastu, diplopija, belooki blowout prelom, čisti prelom orbitalnog poda, odložena intervencija

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Abstract

The basis of the problem: Craniomaxillofacial trauma in pediatric group is less common with an incidence rate of 15% and the most commonly involved site is the fracture of orbital floor. Blow out fractures can either be pure or impure with trauma being the most predominant etiology.

Method: Our case report present a 15 year old patient with a diagnosis of white eye blowout fracture reported ten days post trauma. The case was surgically dealt by releasing the entrapped inferior rectus muscle and placement of titanium mesh in the orbital floor with a postoperative follow up period of 6 months.

Results: In the present report, although the eye movements were evident without any restriction, the authors were unable to achieve a full range of eye movements due to delayed surgical intervention.

Conclusion: Inferior rectus muscle entrapment is the most common entity encountered in cases of white eye blow out fractures, due to its close proximity with the orbital floor and lack of periodontal fat. Early diagnosis and immediate surgical intervention would bring about a best positive outcome in the management of white eye blow out fractures.

Key words: pediatric trauma, diplopia, white eye blowout, pure orbital floor fracture, delayed intervention

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Uvod

Prelomi lica u pedijatrijskoj populaciji ređi su u odnosu na prelome u populaciji odraslih, a uzroci preloma lica kod dece i adolescenata razlikuju se u odnosu na uzroke preloma kod odraslih pacijenata. Prelomi poda orbite česti su u pedijatrijskoj grupi pacijenata i mogu biti neinficirane ili inficirane *blowout* povrede, koje mogu biti povezane sa prelomima zigomaksilarnog kompleksa. Termin "belooki *blowout*" prelom prvi je uveo Džordan 1998¹. Belooki *blowout* prelomi obično se povezuju sa čistim prelomima poda orbite kod dece i adolescenata i nastaju zbog veće elastičnosti kostiju lica. Belooki *blowout* prelomi obično se manifestuju diplopijom, ograničenim pokretima očne jabučice pri pogledu nagore, te zahtevaju brzu dijagnozu i blagovremenu hiruršku intervenciju². Ovaj prikaz slučaja imao je za cilj da predstavi funkcionalni ishod u lečenju belookog *blowout* preloma u dečjem uzrastu.

Prikaz slučaja

U ovom radu, prikazan je slučaj petnaestogodišnjeg pacijenta, koji se 10 dana nakon povrede javio na odeljenje Oralne i maksilofacijalne hirurgije, zbog nemogućnosti gledanja na levo oko, pri pogledu nagore. Anamnestički je dobijen podatak o tome da je pacijent pao u toaletu, pri čemu je došlo do povrede levog oka izazvane tupom silom. Kliničkim pregledom evidentirani su ograničeni pokreti nagore povređenog oka, praćeni diplopijom i subkonjunktivnim krvarenjem (Slika 1). Kompjuterska tomografija prikazuje uklještenje donjeg pravog mišića očne jabučice i diskontinuitet u infraorbitalnom obodu (Slika 2). Slučaj je privremeno dijagnostikovao kao belooki *blowout* prelom. Hirurška intervencija uključila je oslobađanje zarobljenog mišića, nakon čega je usledilo postavljanje titanijske mreže u pod orbite. Autori su dobili pisani informisani pristanak pacijenata za objavljivanje slika (slike priložene u ovom prikazu slučaja pripadaju autorima: dr Karthik Kattur Premkumar i dr Balamurugan Rajendran) i druge kliničke informacije, koje će biti objavljene u časopisu, uz podrazumevanu obavezu autora da imena i inicijali neće biti objavljeni i njihovo zalaganje da se prikrije identitet pacijenta, ali da se njegova anonimnost ne može garantovati.

Introduction

Facial fractures in pediatric groups are less common when compared to adults and the facial fracture patterns of children and adolescence vary in contrast to adults. Orbital floor fractures are common in pediatric group, which can be either pure or impure blowout fractures associated with zygomaticomaxillary complex fractures. The term white eye blowout fracture was first coined by Jordan in 1998¹. White eye blowout fractures are commonly associated with pure blow fractures of the orbital floor in children and adolescence due to greater elasticity nature of the facial bones. Trap door blowout fractures usually present with a clinical sign of diplopia, restriction of upward gaze movements which require prompt diagnosis and timely surgical intervention². The current case report aimed to evaluate the functional outcome in the management of pediatric white eye blowout fracture.

Case report

The current case report article describes a 15 year old patient who presented to the Department of Oral and Maxillofacial Surgery ten days post trauma with a complaint of inability to view in his left eye in the upward direction. History revealed a fall in his restroom with a blunt trauma to the left eye. On clinical examination, restriction of eye movement in the upward gaze with diplopia was evident along with subconjunctival hemorrhage (Figure 1). Computed tomography depicted an inferior rectus muscle entrapment and discontinuity in the infraorbital rim (Figure 2). The case was provisionally diagnosed as white eye blowout fracture. Surgical intervention included release of the entrapped muscle followed by the placement of titanium mesh in the orbital floor. The authors certify that they have obtained written informed patient consent for images (the images enclosed in the current case report refers to authors: Dr. Karthik Kattur Premkumar and Dr. Balamurugan Rajendran) and other clinical information to be reported/publish in the journal with an understanding that names and initials will not be published and due efforts will be made to conceal identity, but anonymity cannot be guaranteed.



Slika 1: Preoperativna slika pokazuje ograničene pokrete leve očne jabučice pri pogledu nagore

Figure 1: Preoperative image showing restriction of left eye movement in the upward gaze



Slika 2: Kompjuterska tomografija (koronalni i sagitalni presek) pokazuje white-eyed belooku blowout povredu

Figure 2: Computed tomography (coronal and sagittal section) showing white-eyed blow out fracture

Hirurška procedura

Opšta anestezija sprovedena je nazalnom endotrahealnom intubacijom. Urađeno je standardno bojenje i drapiranje, kako bi se obezbedila sterilna hirurška procedura. Urađen je test forsirane dukcije, koji je ukazivao na ograničene pokrete oka pri pogledu nagore. Za zaštitu rožnjače stavljeni su tarsorafijski šavovi i napravljene su oznake za subtarzalni pristup. Lokalna anestezija infiltrirana je duž označenih polja. Nakon presecanja kože, izvršeno je presecanje potkožnog tkiva. Identifikovan je i izložen kružni mišić oka. Submuskularna ravan izabrana je kako bi se izbeglo oštećenje septuma. Supraperiostalna disekcija izvedena je preko infraorbitalnog oboda. Dalja disekcija nastavljena je subperiostalno 3 mm inferiorno, u odnosu na ivicu, kako bi se otkrili koštani deo i pod orbite.

Surgical procedure

Under naso-endotracheal intubation general anesthesia was administered. Standard painting and draping was done to ensure a sterile surgical procedure. Forced duction test was performed which indicated a restriction of eye movement in superior gaze. Tarsorrhaphy sutures were placed for corneal protection and markings were made for sub-tarsal approach. Local anesthesia was infiltrated along the markings. Skin was incised followed by subcutaneous dissection. The orbicularis oculi muscle was identified and exposed. Submuscular plane was chosen to avoid damage to the septum. Supraperiosteal dissection was carried over the infraorbital rim. Further dissection was continued subperiosteally 3mm inferior to the rim to expose the bony part and orbital floor. On exploring the floor, muscle entrapment was evident.

Pregledom poda orbite, uklještenje mišića bilo je jasno uočljivo. Zatim je napravljen koštani prozor, adhezije su pažljivo oslobođene pružanjem naizmeničnih pokreta, gde su segmenti preloma bili pritisnuti, kako bi se oslobodio zarobljeni donji pravi mišić oka (Slika 3). Postavljena je titanijumska mreža srednje veličine na pod orbite i vijakom 1,5 mm × 6 mm pričvršćena je za infraorbitalni obod (Slika 4). Nakon fiksacije, urađen je test forsirane dukcije i nisu primećena ograničenja u pokretima oka. Finalno zatvaranje urađeno je u slojevima. Kružni mišić oka zašiven je upotrebom 4-0 vikrila. Zatvaranje sloja kože urađeno je korišćenjem 5-0 prolona. Kasnije je postavljena *frost* sutura, kako bi se izbegli ektropija i ožiljak kože, tako što je slobodni kraj šava zalepljen za čelo.

Later a bony window was created, the adhesions were meticulously freed by providing alternating movements where the fracture segments were depressed to release the entrapped inferior rectus muscle (Figure 3). A medium sized titanium mesh was placed in the orbital floor and secured onto the infraorbital rim using 1.5×6mm screws (Figure 4). After fixation, forced duction test was carried out and no restrictions in the eye movements were noticed. Final closure was done in layers. Orbicularis oculi muscle was sutured using 4-0 vicryl. Skin layer closure was done using 5-0 prolene. Later, frost suture was placed to avoid ectropion and skin scarring by taping the free end of the suture to the forehead.



Slika 3: Klinički slika prikazuje oslobađanje zarobljenog donjeg pravog mišića oka

Figure 3: Clinical image showing the release of entrapped inferior rectus muscle



Slika 4: Klinička slika koja prikazuje rekonstrukciju poda orbite titanijumskom mrežom

Figure 4: Clinical image showing reconstruction of the orbital floor with titanium mesh



Slika 5: Postoperativna slika, koja prikazuje kretanje očiju pri pogleduna nagore bez ograničenja

Figure 5: Postoperative image showing eye movement in the superior gaze without restriction

Postoperativni ishod

Pacijent je praćen nakon operacije u periodu od 6 meseci (Slika 5). Neposrednog postoperativnog dana nije bilo komplikacija. Diplopija je bila prisutna mesec dana, nakon čega se povukla i bili su vidljivi pokreti oka pri pogledu nagore, bez ograničenja. Međutim, kompletan niz pokreta oka u pogledu nagore nije bio značajan, jer nam se pacijent javio deset dana nakon povrede.

Diskusija

Termin belooki blowout prelom, kao takav, uveden je zbog termina koji opisuje nedostatka krvarenja u subkonjunktivalnom regionu¹. Belooki *blowout* prelomi najčešće se povezuju sa čistim *blowout* prelomima, koji pretežno pogađaju decu i adolescente uzrasta od 5 do 16 godina. Anatomski, debljina medijalnog orbitalnog zida kreće se od 0,2 mm do 0,4 mm, a dno orbite iznosi 0,5 mm³. Pod orbite skloniji je prelomima, zbog gubitka efekta podupirača i prisustva inferiorne orbitalne fisure³. Za sada, predložene su tri teorije za definisanje blowout preloma, a to su hidraulička teorija, teorija savijanja i vođena koštana teorija^{4,5}. Hidrauličke teorije i teorije savijanja najšire su prihvaćene, što čini osnovu mehanizama preloma u okviru *blowout* preloma⁶.

Klinički, reakcije mekog tkiva, kao što su hematoma i periorbitalna ekhimoza nevidljive su, jer je uticaj sile mali i nema pojave enoftalmusa, zbog toga što je sadržaj orbite zarobljen unutar frakture⁷.

Postoperative outcome

Aftersurgery the patient was reviewed for a period of 6 months (Figure 5). No complications were elicited on the immediate postoperative day. Diplopia was present for a period of 1 month after which it got resolved and the eye movement in superior gaze was evident without any restriction. However, a full range of eye movements in the upward gaze was not significant as the patient reported to us with ten days post trauma.

Discussion

The term white-eye blowout fracture was described due to the lack of hemorrhage in the subconjunctival region¹. White eye or trap door blowout fractures are most commonly associated with pure blowout fractures predominantly affecting children and adolescents of 5-16 years of age. Anatomically, the thickness of the medial orbital wall ranges from 0.2mm to 0.4mm and the floor of orbit measures 0.5mm³. The orbital floor is more prone to fracture because of the loss of buttressing effect and due to the presence of inferior orbital fissure³. Three theories have been currently proposed to define the blowout fractures, namely hydraulic theory, buckling theory and bone conduction theory^{4,5}. Hydraulic and buckling theories are most widely accepted which forms a basis for fracture mechanism in trap door blowout fractures⁶.

Clinically, the soft tissue responses such as hematoma and periorbital ecchymosis are unseen as the impact of force is low and the occurrence of enophthalmos is absent as the contents of the orbit are entrapped within the fracture⁷.

Pozitivna klinička slika uključuje laceraciju ili abraziju, periorbitalno oticanje, ograničenje pokreta očnih jabučica pri pogledu nagore, praćeno binokularnom diplopijom, okulokardijalni refleks i pozitivan test prinudne dukcije. Iako okulokardijalni refleks ostaje klasičan nalaz, on je takođe bio indikacija za operaciju, jer duže trajanje refleksa može dovesti do bradikardije i srčanog bloka^{8,9}. Radiografski, belooki *blowout* prelom dokazan je postojanjem uklještenja mekog tkiva (donji pravi mišić oka) i preloma donjeg orbitalnog oboda. Neinstein i saradnici⁷ su putem morfološke procene zasnovane na CT opisali to da je donji pravi mišić oka češće zahvaćen, zbog bliske aproksimacije mišića na dnu orbite i istovremenog nedostatka periorbitalne masne podrške.

Vreme operacije igra važnu ulogu, a trenutna literatura prihvata činjenicu da se zbrinjavanje belookih *blowout* preloma mora izvesti u roku od 24 sata do 48 sati. Yang i saradnici¹⁰ primetili su to da nije bilo razlika u stopi uspešnosti operacije kada je obavljena u roku od 24 h od nastanka povrede, između 24 h i 72 h i posle 72 h od nastanka povrede. Balaraman i saradnici² izvestili su o tome da odloženo hirurško lečenje dovodi do trajnog ograničavanja pokreta očiju pri pogledu nagore, što na kraju izaziva diplopiju, dok rana hirurška mera vraća normalnu funkciju mišića i sprečava pojavu ishemije ekstraokularnih mišića. U ovom prikazu slučaja, predstavljeno je odloženo hirurško lečenje, budući da se klinička manifestacija bolesti javila 10 dana nakon povrede orbite. Test forsirane dukcije bio je negativan nakon operacije. Egbert i saradnici¹¹ i Bansagi i saradnici¹² izvestili su o tome da oporavak poda orbite nakon povrede traje oko 10 do 14 dana kod odraslih, dok je kod dece trajanje oporavka kraće, zbog direktnog oštećenja mišića.

Postoperativno, diplopija je bila najčešća komplikacija, koja se javljala kod pacijenata sa > 50% perzistentnih belookih *blowout* preloma. Vreme oporavka od postoperativne diplopije može da se kreće od 25 dana do 18 meseci, sa dužim trajanjem kod dece mlađe od 9 godina^{10,13}. U ovom prikazu slučaja, iako su pokreti oka pri pogledu nagore bili evidentni, bez ikakvih ograničenja, autori nisu uspeli pacijentu da omoguće čitav spektar pokreta oka, zbog odložene intervencije izazvane činjenicom da roditelji pacijenta nisu bili svesni značaja brze terapije. U buduće, treba se odlučiti za pravovremeni hirurški zahvat, kako bi se sprečili ovakvi nepovoljni ishodi.

The positive clinical presentation includes laceration or abrasion, periorbital swelling, restriction of eye movements in superior gaze with binocular diplopia, oculocardiac reflex and positive forced duction test. Though oculocardiac reflex remains a classical finding, it is also an indicator for surgery as the long term persistence of reflex may lead to bradycardia and heart block^{8,9}. Radiographically, white eye blow fracture evidenced with soft tissue (inferior rectus muscle) entrapment and fracture of the inferior orbital rim. Neinstein et al.⁷ through CT-based morphological assessment describes that the inferior rectus muscle is more commonly involved because of the close approximation of the muscle to orbital floor and concomitant lack of periorbital fat support.

Timing of surgery plays a major role and the current literature accepts the fact that white-eyed blowout must be intervened within 24–48 hours. Yang et al.¹⁰ observed that there was no differences in the success rate of the surgery when it was performed within 24 h, between 24 and 72 h and after 72 h. Balaraman et al.² reported that delayed surgical treatment lead to permanent restriction of eye movements in the upward gaze eventually causing diplopia whereas, early surgical measure restores the normal function of the muscle and prevents the occurrence of ischemia to the extraocular muscles. In the present case report, a delayed surgical treatment was initiated as the clinical presentation of the patient was 10 days after the trauma to the orbit. Intraoperatively, the forced duction test was found to be negative after the surgery. Egbert et al.¹¹ and Bansagi et al.¹² reported that the repair of orbital floor took around 10-14 days in adults whereas the duration of repair is shorter in children because of the direct muscle damage.

Postoperatively, diplopia was the most common complication encountered in patients with >50% of persisting white eye blowout fractures. The recovery time for the postoperative diplopia may range from 25 days to 18 months with a longer duration encountered in children <9 years of age^{10,13}. In the present report, although the eye movements in the superior gaze were evident without any restriction, the authors were unable to achieve a full range of eye movements due to delayed intervention caused by the unawareness of the patient's parent. Henceforth, timely surgical procedure should be opted in order to prevent such unfavorable outcomes.

Zaključak

Slučajevibelookih *blowout* preloma kod dece zahtevaju posebnu pažnju. U slučaju belookog *blowout* preloma, klinički i radiografski prikaz mogu biti suptilni. Rana dijagnoza (u roku od 7 dana) i hitna hirurška intervencija doneli bi najbolji pozitivan ishod.

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Conclusion

In cases of pediatric orbital bone fractures, special attention is required. In the event of white-eye blowout fractures the clinical and the radiographic presentation may be subtle. Early diagnosis (within 7 days) and immediate surgical intervention would bring about a best positive outcome.

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