Evaluating the Risk Factors and Time-course of High Intraocular Pressures in Severely Burned Patients

Anthony P. Mai[1], Christopher R. Fortenbach[1], Lucy A. Wibbenmeyer[2], Kai Wang[3], Erin M. Shriver[1]
Departments of [1]Ophthalmology and Visual Sciences, [2]Surgery, and [3]Biostatistics, University of Iowa, Iowa City, IA

Introduction

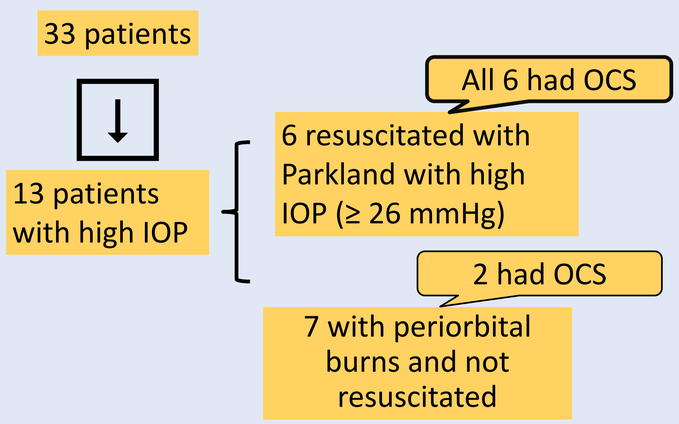
Burn patients receiving aggressive fluid resuscitation are at risk of developing orbital compartment syndrome (OCS). This condition results in elevated orbital pressures and can lead to rapid permanent vision loss. Risk factors and monitoring frequency for OCS remain largely unknown.

Methods

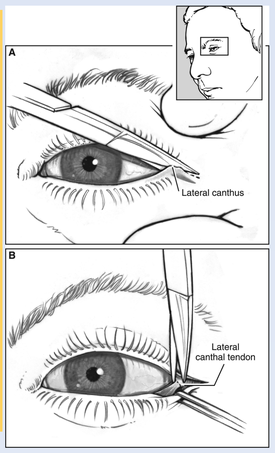
A retrospective review was conducted of admitted burn patients at an American Burn Association verified Burn Treatment Center between May 2004 and May 2019. Inclusion Criteria included: Inpatient burns + ophthalmology consult OR Lateral canthotomy/cantholysis OR orbital compartment syndrome (OCS). Exclusion criteria included: no IOP documentation during admission, electrical burn, and history of glaucoma. Variables collected included: demographic, burn, ophthalmologic examination, and fluid resuscitation. Data were compared using 2-sided t-tests, Fisher's Exact tests, and linear regression.

Results

33 patients met the inclusion criteria out of 430 patient records reviewed. The mean patient age was 39.6 ± 15.1 years, subjects were predominantly male (79%), and the mean % total body surface area (TBSA) burned was 31.0% ± 22.1%. Eight patients developed OCS and 6 underwent lateral canthotomy/cantholysis (C/C).

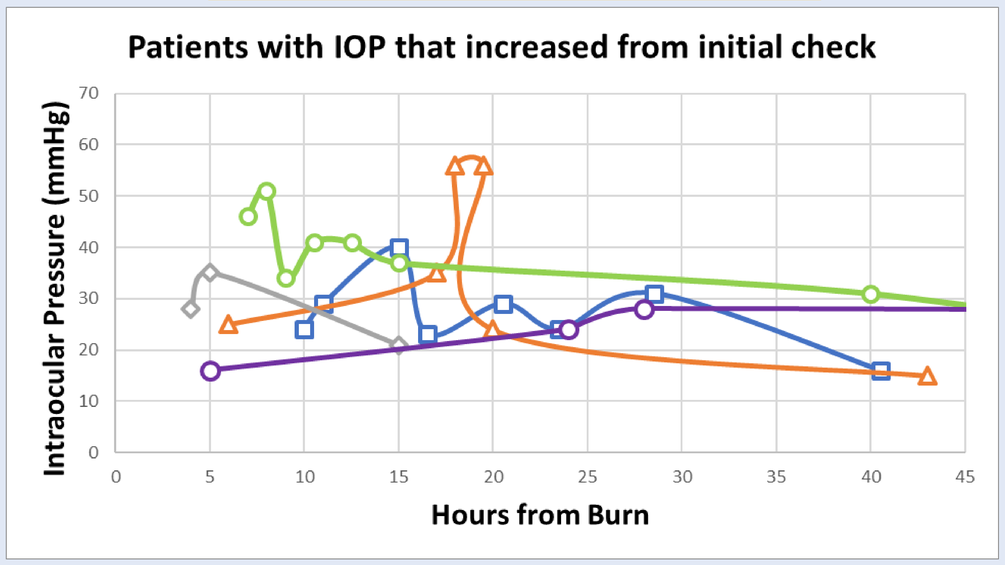


- Suspect in patients with:
  - IOP ≥ 35 mmHg
  - Periocular edema and proptosis
  - Ophthalmoplegia and decreased vision
  - Fixed, large pupil
- Retinal ischemia → permanent vision loss
- Lateral canthotomy/cantholysis or lid split

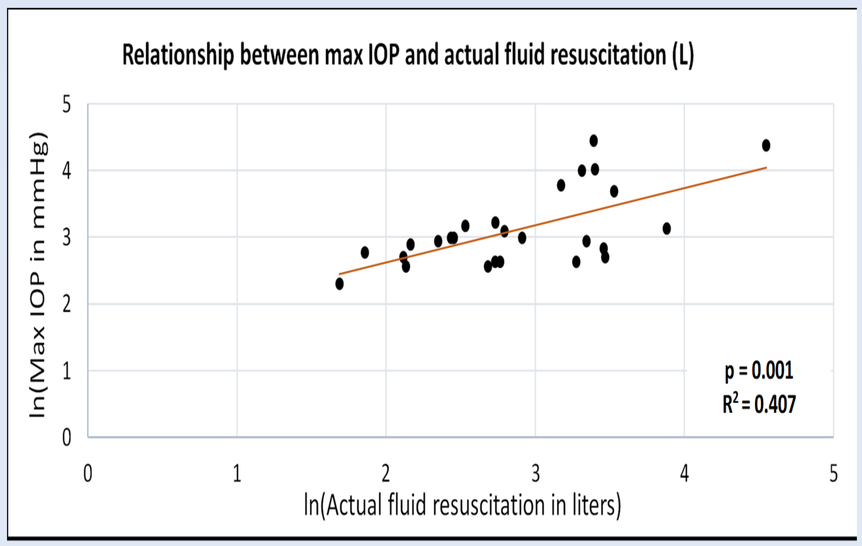


Variable	High IOP	Control	P value
% TBSA burned ± SD	63.5 ± 15.3	30.7 ± 15.1	0.002
% With vasopressor use	83%	35%	0.065
% With albumin use	67%	20%	0.051
% With chemosis	100%	50%	0.053
Parkland formula calculation (L) ± SD	22.1 ± 6.1	10.9 ± 5.4	< 0.001
Actual fluid resuscitation (L) ± SD	39.9 ± 27.0	17.3 ± 10.8	0.097
% With volume > 250 ml/kg (Ivy)	83%	25%	0.018

IOP Time-course Analysis



After initial checks, 5 patients had a mean IOP increase of 3.7 mmHg/hr; highest rise of 31 mmHg in 12 hrs
C/C (Blue/Orange); Drops (gray/green); observed (purple)



Significance

- Recommendations:
  - Elevate head of bed
  - Baseline IOP soon after admission in
    - In patients receiving aggressive resuscitation
    - In periocular burns
  - Serial examinations in first 24-48 hours
  - Stat consultation for non-distractable lids

Conclusion

Orbital congestion can develop within the first 24 hours of admission when resuscitation volumes are the greatest. In addition to earlier and more frequent IOP checks in susceptible burn patients during the first day, the identified associated risk factors will help target therapy to those most at risk for OCS and vision loss.

References

Sullivan, S.R., J Trauma, 2006
Singh, C.N. Plast Reconstr Surg, 2008
Hurst, J. Orbit, 2014
Ivy, M.E., . J Trauma, 2000
Strang, S.G. Burns, 2014