30 years experience of rinsing in acute eye burns "Dilution" or "Decontamination"? Is there a difference?

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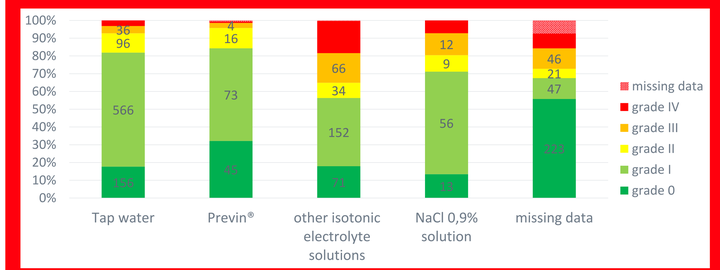
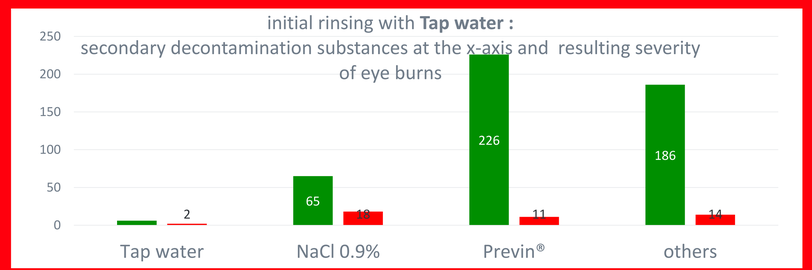
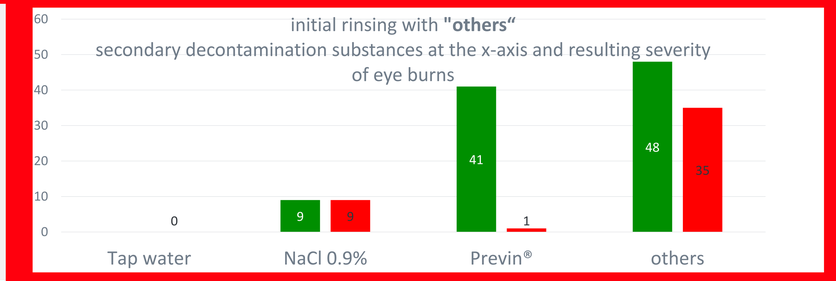
Purpose: There is currently uncertainty about the most efficacious decontamination solution for corrosive chemical eye burns. This 30-year longitudinal study evaluated the relative efficacy of two different decontamination methods. *Passive* decontamination consists of rinsing with tap water, 0.9% normal saline, isotonic buffered phosphate solution, or Ringer's lactate. *Active* decontamination adds an amphoteric, polyvalent and chelating component with Previn® (Diphoterine®) solution (Laboratoire Prevor, Valmondois, France). **Methods:** A prospective evaluation of patients treated in two specialized eye clinics for eye burns was begun in 1988. Recorded data included: exposure circumstances, type of corrosive, different types of first therapy, and clinical treatment and outcome. Patients were treated from clinic admission and up to 24 hours after the corrosive chemical burn with rinsing for 15 minutes using two different protocols. From 1988-2005, sterile 0.9% normal saline or Ringer's lactate was used. Since 2006, sterile, hypertonic, amphoteric Previn® solution was used. Comparative statistical analysis was done with Fisher contingency tables and Wilcoxon tests. **Results:** There were a total of 1,495 patients with 2,194 chemically burned eyes. In 1988-2005 the annual incidence was 66.1/year; in 2006-2017, it was 65.5/year. Similar incidences were noted when initial rinsing was with tap water or isotonic buffered phosphate solutions. There was a significantly more severe outcome of corrosive chemical eye burns with any first aid rinsing solutions other than Previn® solution or tap water was used (p<0.001). Previn® solution or tap water rinsing in the pre-hospital setting and secondary rinsing with Previn® solution in the hospital decreased lesion severity in comparison with all other rinsing solutions (p<0.001).
Conclusion: The frequency of corrosive chemical eye burns was comparatively high despite tightening of occupational health and safety regulations over the past 30 years. The severity of corrosive chemical eye burns has been dramatically decreased since the introduction of Previn® solution for initial and secondary rinsing. A new protocol for immediate Previn® solution use by the Cologne Fire Brigade and secondary Previn® solution rinsing in hospital has reduced the frequency of severe corrosive chemical eye burns to less than 60% as compared to the period of 1988-2005 when other rinsing solutions were utilized.





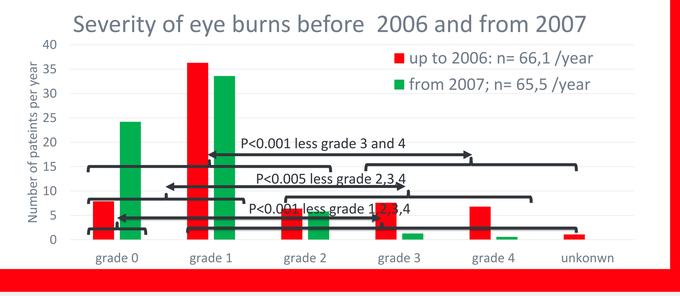
Secondary rinsing in the ophthalmolgical department has been performed regularly. This is the main influence that we as Ophthalmologists have and where we can modify the eye burn. This is the major independet variable of this study protocol because all other data from first aid are taken from the patients anamnesis. Thus we evaluated the influence of the secondary rinsing on the severity of eye burns in grades of 0-II as light (green columns) and severe grades III&IV (red columns). There is evidence that secondary decontamination has an influence on the resulting severity of eye burns. Independent on anamnestic „FIRST AID" rinsing solutions used, there is a statistically striking reduction of severity outcomes if decontaminationwith Previn® (Diphoterine®) is performed.
The statistical workup of the diagrams at the left is done in the table below. There is a considerable lower incidence of severe eye burns of grade III and IV if secondary decontamination with Previn is performed within the department of Ophthalmology.

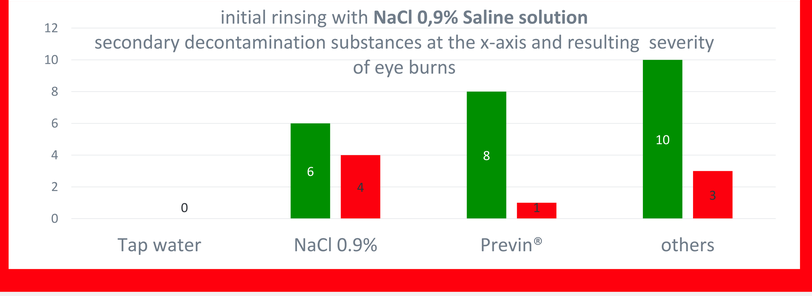
Columns give the number of eyes being rinsed in FIRST AID with the specified solution below. The grades of eye burns severity following the classification of Roper Hall (& Reim) is given in colours from green (I light) to red (IV severe). The distribution of light and severe eye burns after rinsing is influenced by the ***FIRST AID*** rinsing solution used. There is a considerable lower incidence of severe eye burns in case of the use of Tap water and Previn® (Diphoterine®) compared to isotonic electrolyte solutions, NaCl 0,9% solution and missing data. These data subsummarized in grades 0-II and III+IV showed in the diagram below shows significant differences between Ta water, Previn® (Diphoterine®) decontamination in first aid compared to all other first aid solutions.



	secondary rinsing:	Tap water	NaCl 0.9%	Previn®	others
First rinsing:	**Degree of severity**				
Tap water	**0-II**	**6**	**65**	**226**	**186**
	III&IV	**(++) 2**	**(++) 18**	**11**	**(++) 14**
NaCl 0.9%	**0-II**	**0**	**6**	**8**	**10**
	III&IV	**0**	**(++) 4**	**1**	**(++) 3**
Previn®	**0-II**	**0**	**0**	**12**	**0**
	III&IV	**0**	**0**	**3**	**0**
others	**0-II**	**0**	**9**	**41**	**48**
	III&IV	**0**	**(++) 9**	**1**	**(++) 35**

others =Ringer+Isogutt+ Sterofundin+ rinsing without specification





Secondary rinsing (in the Emergency room of our Hospital) and severity of eye burns. The ***decontamination*** with Previn® (Diphoterine®) in secondary rinsing results in statistical significant lower rate of severe eye burns compared to all other groups p <0.0001 except the primary decontamination with Previn with very few cases of relatively high grade of severity.

Discussion: The secondary rinsing in our department was done in a reproducible way of 15 min rinsing. 3 minutes of flushing and then dropwise application. There is strong evidence that this protocol of secondary decontamination with Previn® (Diphoterine®) [(6)] lowers severity of eye burns. Before 2007 we had more than 75% more degree III &IV eye burns. After the introduction of Previn® (Diphoterine®) there was a lower incidence of severe eye burns. For initial rinsing it is true that any eye burns should be rinsed as soon as possible with Diphoterine (Previn) or tap water. All other substances in this study have proven to perform worse.
Ophthalmologist should train their emergency department to optimize the secondary rinsing therapy. In our protocol rinsing for 15 min with Previn® is a „red flag" Manchester triage procedure [(7)]. By that we reduced the incidence of severe eye burns from before 2005 to after 2006 to 25 % of the original grades of severity.

Literature:
1: Kompa S, Redbrake C, Hilgers C, Wüstemeyer H, Schrage N, Remky A. (2005) Effect of different irrigating solutions on aqueous humour pH changes, intraocular pressure and histological findings after induced alkali burns. Acta Ophthalmol Scand 83(4):467-470.
2: Rihawi S, Frentz M, Becker J, Reim M, Schrage NF. (2007) The consequences of delayed intervention when treating chemical eye burns. Graefes Arch Clin Exp Ophthalmol 245(10):1507-1513.
3: Scott WJ, Schrage N, Dohlman C. (2015) Emergency eye rinse for chemical injuries: new considerations. JAMA Ophthalmol 133(3):245.
4: Rihawi S, Frentz M, Schrage NF. (2006) Emergency treatment of eye burns: which rinsing solution should we choose? Graefes Arch Clin Exp Ophthalmol 244(7):845-854.
5: Rihawi S, Frentz M, Reim M, Schrage NF. (2008) Rinsing with isotonic saline solution for eye burns should be avoided. Burns 34(7):1027-1032.
6: Merle H, Donnio A, Ayeboua L, Michel F, Thomas F, Ketterle J, Leonard C, Josset P, Gerard M. (2005) Alkali ocular burns in Martinique (French West Indies): Evaluation of the use of an amphoteric solution as the rinsing product. Burns 31(2):205-211.
7: Mackway-Jones K, Marsden J, Windle J (eds.). (2011) Ersteinschätzung in der Notaufnahme. Das Manchester-Triage-System. 3. überarbeitete und ergänzte Auflage.

COMPLIANCE WITH ETHICAL STANDARDS
This was a retrospective study of a prospectively-collected registry of patients treated for corrosive chemical eye burns in the authors' institutions. All patient-specific identifying information was removed from the registry and replaced with identifying numbers only. No patient-specific identifying information is presented here. For this reason, the authors' institutions do not require approval by an Institutional Review Board or Human Subjects Committee. As the study was performed in Germany, considerations relating to US HIPPA regulations do not apply.
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Conflict of interest:
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