

# Prognostic Factors for Successful Surgical Outcome in Canaliculi Repairs

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**Objective:** To investigate the prognostic factors that contribute to successful surgical outcome in canaliculi repairs from accidents, in terms of anatomic and function of nasolacrimal duct, at Thammasat University Hospital.

**Research design:** Retrospective, descriptive study

**Methodology:** Retrospective medical records for patients presenting with canaliculi and lid tear, which received canaliculi repairs and lid repairs under general anesthesia during the duration of five years, from 2012 to 2017 at Thammasat University Hospital and follow-up for one year.

**Results:** Fifty-four patients canaliculi and lid tear and subsequently received canaliculi repairs and lid repairs with are annular intubation (Pigtail). However, only 39 patients had sufficient data to be included in the study. It was found that both the material used in the canaliculi (Vicryl) and lid repairs (Nylon) had a diameter of more than 0.7 mm, which is a significant important prognostic factor for successful surgical outcome ( $p < 0.05$ ), where the ratio of MI 20 (57.14) ( $p = 0.047$ ) and MI 20 (58.82) ( $p = 0.020$ ), respectively. Furthermore, achieving canaliculi repairs in an anatomically correct position not only contributes to cosmetic effect, but is also a statistically significant important prognostic factor for successful surgical outcome ( $p < 0.05$ ). Qualified ophthalmologists directly performing the surgeries also contribute to a statistically significant better results when compared to residents ( $p < 0.05$ ).

**Conclusion:** The selection of materials for canaliculi and lid repairs with diameters larger than 0.7 mm (Vicryl 7/0 for pericanaliculi and nylon 7/0 for repair lid) is an important prognostic factor that contribute to successful surgical outcome in canaliculi repairs.

**Keywords:** MI (large non-absorbable material), canaliculi repair, bi-canalicular stent, lid repair

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## Introduction

Eye injuries are oftentimes found and lead to both internal and external anatomical changes, which eventually result in eye complications and lid tear as they are soft tissues in areas that cover other important structures of the eye. Thus, in cases of lid tears, it is necessary to repair it back to its original position to enable functions of the punctum, sebaceous glands as well as the opening and closing of the eyes.

The canaliculi is an important feature within the eyelid, which can be found within both the upper and lower punctum. It transports lacrimal fluid to the common canaliculi, which

is located approximately 8-10 mm from the punctum. Thereafter, the lacrimal fluid will be accumulated at the lacrimal sac, which is approximately 12-15 mm in length, before being carried towards the nasolacrimal duct, which is approximately 12-18 mm in length. It is apparent that lacrimal secretion is complex, even in normal conditions. Thus, in events of eye injuries, immediate repair is an obligatory step to prevent complications, such as epiphora, blepharitis, among others.

There are a number of studies on the eyelid and canaliculi repairs. The most popular are annular intubation (Pigtail), bicanalicular stent, monocanalicular stent. Naing L Tint *et al*<sup>1</sup> reported that a majority of lid and duct tears are caused by blunt trauma in the lower part, which can be reconstructed by bi-canalicular stenting produces satisfactory results without

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having to conduct posterior lacrimal crest fixation suture. Moreover, it restores the eyelid back to a favourable position and minimizes the obstruction of tear drainage. Similarly, *Tavakoli M et al*<sup>2</sup> reported reconstruction using monocanalicular silicone tube had an anatomical and functional success rate of 87% and 100%, respectively. Other factors, such as suitable surgical time and materials used also contribute to the successful surgical outcome.

*Zhuang A et al*<sup>3</sup> suggested that surgical canaliculi repairs of inpatients within 48 hours of the injury by bi-canalicular Crawford stenting had a 96% success rate. Furthermore, lateral tears contributed to the most successful outcome.

This study highlights importance of eyelid and canaliculi repairs in terms of the success rate and methodology used at Thammasat University Hospital to further contribute to known literature regarding treatment approaches.

## Methodology

This retrospective descriptive study in patients involved in accidents with canaliculi and lid tear, which received reconstruction at Thammasat University Hospital. Patient data were accessed retrospectively using E-phiz ICD9-0973 Program during 2012 to 2017 whose were diagnosed that canaliculi tear in zone 1 which not involve lacrimal sac and without facial bone fracture. 54 patients were enrolled according to the inclusion criteria, but 15 were excluded according to the exclusion criteria due to lack of follow up in 1 month, resulting in 39 patients for the study. The surgeon chose Pigtail annular intubation 39 patients. Data of patients with canaliculi repairs ICD9-0973 were reviewed from medical records, which had the accident history and information on age, gender, cause, location, position, length of time between injury and surgery, technique used, size of the injury and details on the surgery and subsequently analyzed.

Statistical analysis on the baseline characteristics of the patients, which included age, gender, cause, location, position, length of time between injury and surgery, technique used, size of the injury of each group were collected and analyzed in terms of mean and standard deviation (SD) using 95% CI ( $P < 0.05$ ) via STATA version 12 (Stata Corp, College Station, TX, USA) at power 80%, 5% confidence level ( $p < 0.05$ ), one-way side.

## Results

Cases from the past five years showed that 54 patients were involved in accidents at canaliculi and lid tear and subsequently received canaliculi repairs using Pigtail Annular intubation. However, 39 patients met the inclusion criteria. Baseline characteristics, including age, location, length of time between injury and surgery, eyesight before and after the surgery showed no statistical difference at a confidence level of 5%.

The study evaluated the success rate prior to and following surgery by irrigation sac, where ophthalmologists conducts anatomical and functional evaluation of the tear duct at 1 month and 6 months following the surgery<sup>5</sup>. Findings revealed that the materials used for repair pericanaliculi tissue surgery with a diameter of more than 0.7 mm (vicryl 7/0) were shown as a statistically significant important prognostic factor for successful surgical outcome in canaliculi repairs ( $p < 0.05$ ) for MI 20 (57.14) ( $p = 0.047$ ).

Like the Fang Bai, Hai Tao, Yan Zhang, Peng Wang, *et al* study, their use of silk 5/0 in skin suture is more provocative than in patients with tear canalicular involve eyelid. It may be one of reason that the surgery unsuccessful, therefore their chose to use bicanalicular stent intubation<sup>6</sup>. Similarly, materials used for eyelid surgery with a diameter of more than 0.7 mm (nylon 7/0) were shown as a statistically significant important prognostic factor for successful surgical outcome in canaliculi repairs for MI 20 (58.82) ( $p = 0.020$ ) at a confidence level of 5%.

In addition, the lid repair and reconstruction to the original anatomically correct position not only contributes to cosmetic effect but is also a statistically significant important prognostic factor for successful surgical outcome ( $p < 0.05$ ). Correspondingly, ophthalmologists directly performing the surgeries also contribute to a statistically significant better results when compared to residents ( $p < 0.05$ ).

Complications arose from canaliculi repairs and lid repairs in patients with tear duct injuries included two cases of lagophthalmos, one case of angle recess, one case of ectropion and two cases of dry eye.

## Discussion

The study selected Pigtail Annular intubation as a surgical technique, enabling the

**Table 1** baseline characteristics of patients, comparing between success and failure outcome at 1 months post-operation

Parameter	Fail	Success	p-value
Male sex ( n/%)	15 (48.39)	16 (51.61)	0.695
Age	44.6 +/- 11.55	19.26+/- 11.95	<0.001*
Time to Sx	9.15+/- 5.63	7.32 +/-4.56	0.137*
% of Good VA before surgery (n/%)	15 (75)	15 (16.67)	0.697
% of good VA after surgery (n/%)	19 (95)	17 (89.5)	0.605
Material canaliculi <7.0 vs >7.0	42.86	100.00	0.047
Material lid <7.0 vs >7.0	41.18	100.00	0.020
Surgeon trainee vs staff	37.93	80.00	0.031
Lid position favourable vs unfavourable	26.09	81.25	0.001

No symbol = Fisher's exact test

\*: t-test

**Table 2** baseline characteristics of patients, comparing between success and failure outcome at 6 months post-operation

N=39

Parameter	Fail	Success	p-value
Male sex ( n/%)	16 (76.19)	15 (83.33)	0.695
Age	44.6 +/- 11.55	19.26+/- 11.95	<0.001*
Time to Sx	9.15+/- 5.63	7.32 +/-4.56	0.137*
% of Good VA before sx (n/%)	16 (76.19)	14 (82.35)	0.697
% of good VA after sx (n/%)	20 (95.24)	16 (88.89)	0.605
Material canaliculi <7.0 vs >7.0	42.86	100.00	0.047
Material lid <7.0 vs >7.0	41.18	100.00	0.020
Surgeon trainee vs staff	37.93	80.00	0.031
Lid position favourable vs unfavourable	26.09	81.25	0.001

No symbol = Fisher's exact test

\*: t-test

possibility to equitably compare factors that contribute to the success of canaliculi repairs. The precedent technique is widely used, cheap and may be performed by residents and ophthalmologists.

The number of patients were collected from patients who undergone surgery for canaliculi repairs at Thammasat University Hospital in the past five years, which may not be as informative due to incomplete track record of treatment. However, this research may be used as a pilot study for future treatments.

An investigation in China conducted by Zhuang A et al<sup>3,4</sup> showed that canaliculi repairs for inpatients within 48 hours following the accident via bi-canalicular stenting had a success rate of 96%. Meanwhile, this particular study was achieved in a well-equipped medical school in terms of staff and facilities, thus patients received treatment within an average of 24 hours, resulting in no statistically significant time difference as elaborated by Zhuang A et al<sup>3</sup>

Findings suggested that materials used for pericanaliculi repairs with a diameter of more than 0.7 mm (Vicryl 7/0) and lid repairs with a diameter of more than 0.7 mm (Nylon 7/0) is an important prognostic factor that contribute to successful surgical outcome in canaliculi repairs by Pigtail Annular intubation.

However, most studies often include bicanaliculi stent, which will give better results. Material selection may not be the main factor in surgery. In addition, the experience of the surgeon is important. If you have surgery with an ophthalmologist, you will get a more successful outcome compared to a surgeon trainee, resulting in statistically significant.

Another factor is the position of the eyelids after repair. Found that if the suture is repaired, return to be close to the patient's original eyelid position. Will be result in successful surgery same as the study of Fang Bai, Hai Tao, Yan Zhang, Peng Wang, et al study<sup>6</sup>. Which describes the position of the eyelid after surgery as one of the key factors for successful surgical resection of the tear canaliculi. In this research, young patients are one of the key success factors in table 2. But the researcher views that, May not be able to make a decision because the number of patients attending the study is not enough.

This information may be used to consider purchasing equipment in operation rooms

for hospitals with limited medical supplies. Furthermore, it may be used as a practice guideline for ophthalmologists and residents in choosing a suitable material in the future.

## Conclusion

The selection of materials for pericanaliculi repairs with a diameter of more than 0.7 mm (Vicryl 7/0) and lid repairs with a diameter of more than 0.7 mm (Nylon 7/0) is an important prognostic factor that contribute to successful surgical outcome in canaliculi repairs by Pigtail Annular intubation. Furthermore, the position of the lid following the repairs as well as experience from ophthalmologists are also contributing factors for success.

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