10th Evolving Practice Of Ophthalmology Middle East Conference
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Transcanalicular Laser assisted and External Dacryocystorhinostomy Anatomical and Functional success in Acquired Nasolacrimal Duct Obstruction: Systematic review and meta-analysis

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Outline

Introduction → Methods → Results → Discussion → Conclusion

Introduction

- **Nasolacrimal Duct Obstruction (NLDO)** is a condition characterized by blocked tear ducts, resulting in symptoms such as **epiphora and dacryocystitis.**
- **NLDO** has a relatively high incidence rate of **20.24 per 100,000**, indicating its common occurrence.
- **NLDO** subtypes:
  - **Primary NLDO,** an idiopathic clinical syndrome.
  - **Secondary NLDO,** due to trauma, infection, mechanical factors, neoplasms, or inflammation.
- The **definitive management** approach for Primary NLDO is **Dacryocystorhinostomy (DCR)**, which can be performed using different techniques.
  - (External VS. Transcanalicular laser assisted VS. Endoscopic Endonasal DCR).

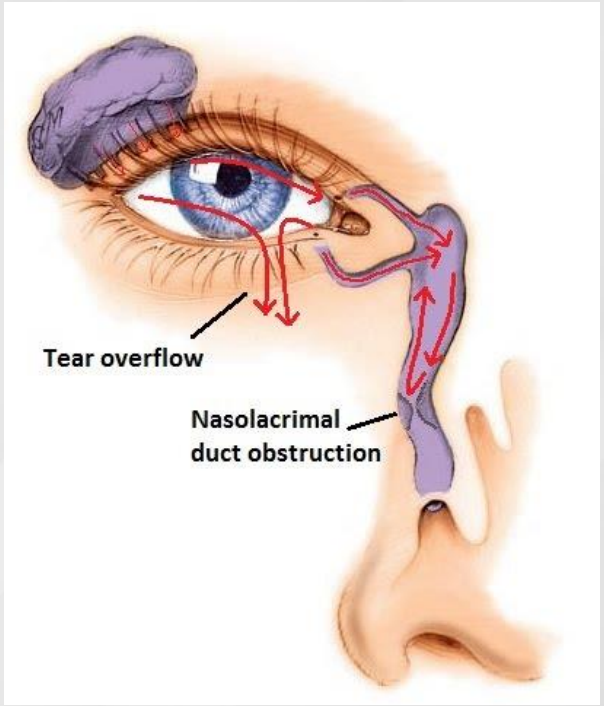

Figure 1: Nasolacrimal Duct Obstruction.

Introduction

- **Dacryocystorhinostomy (DCR) types:**

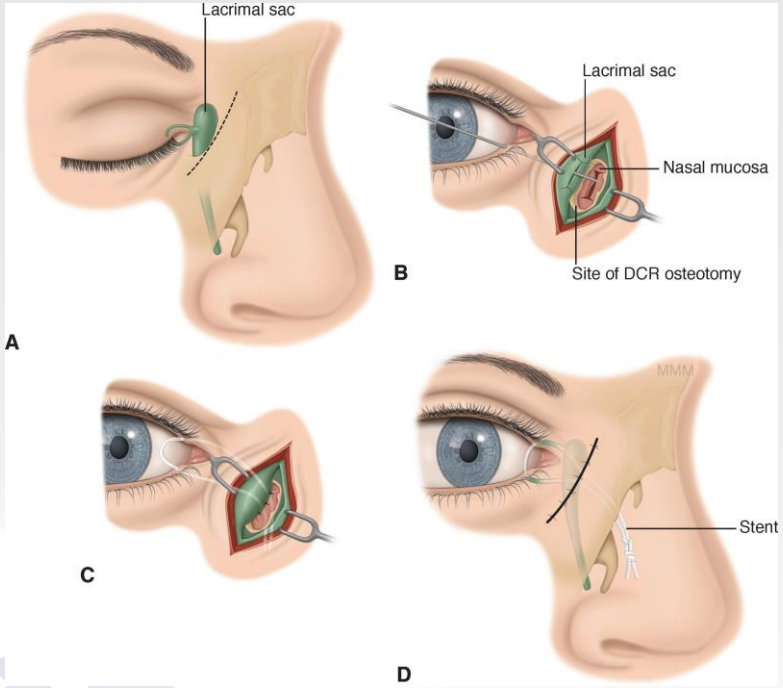

Figure 2: External dacryocystorhinostomy. (EX-DCR)

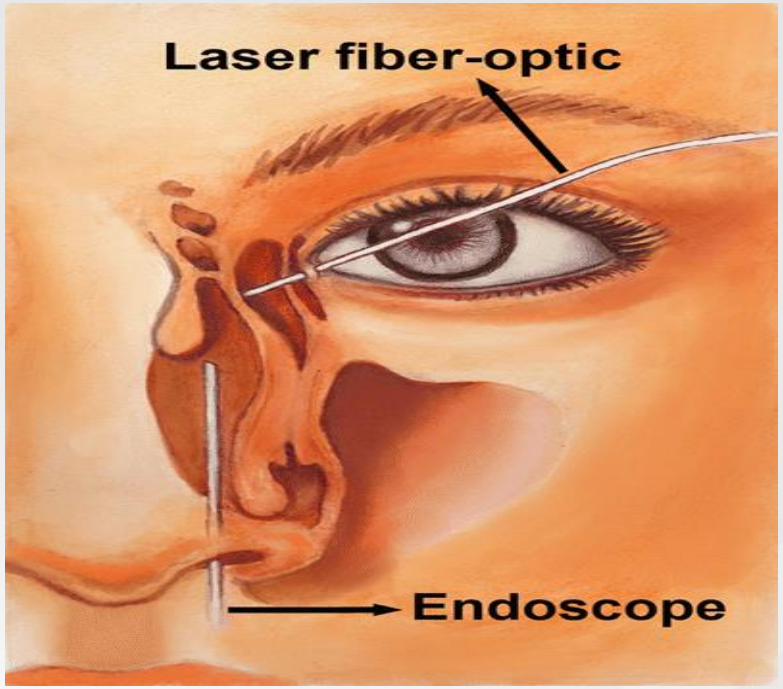

Figure 3: Transcanalicular laser dacryocystorhinostomy. . (TC-DCR)

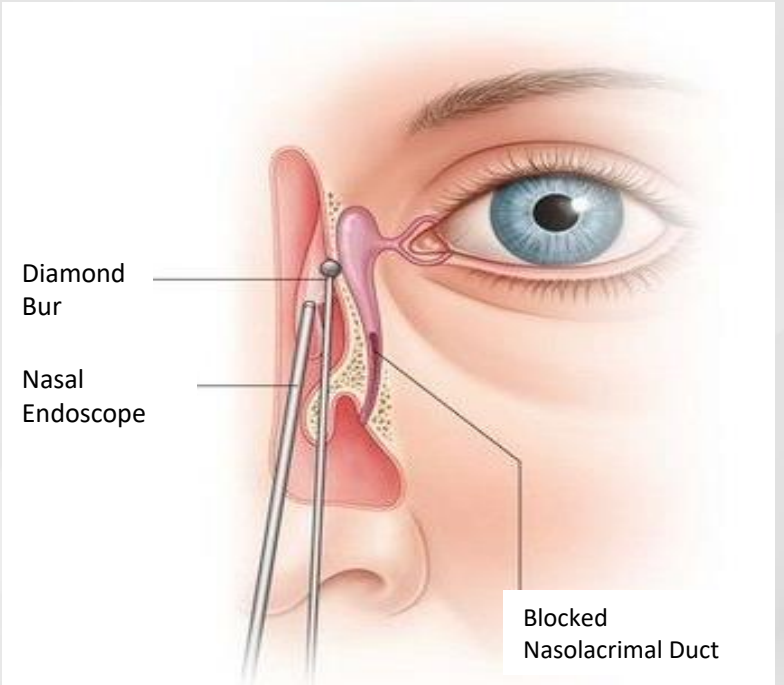

Figure 4: Endoscopic endonasal dacryocystorhinostomy. . (EN-DCR)

Introduction

❑Comparison Between **Dacryocystorhinostomy (DCR)** types:

	EXTERNAL DACRYOCYSTORHINOSTOMY (EX-DCR)	TRANSCANALICULAR LASER DACRYOCYSTORHINOSTOMY (TC-DCR)
PROS	I. Excellent success rates ○ reported to be up to **90-95%**. II. Direct visualization of lacrimal sac abnormalities.	I. Minimally invasive procedure ○ Better aesthetic outcomes II. Shorter intraoperative duration III. Lower perioperative complications
CONS	I. Longer intraoperative duration II. Higher perioperative complications	I. Lower success rate

Table 1: Comparison between External dacryocystorhinostomy (EX-DCR) and Transcanalicular laser dacryocystorhinostomy (TC-DCR)

Introduction

❑Significance:

- Previous review was limited.
- No Consensus over the preferred surgical techniques.

❑ Aim:

- To examine the **efficacy** (anatomical and functional success rates) and **safety** (intraoperative complications, postoperative complications, and surgical time) of TC-DCR versus EX-DCR techniques specifically for patients with Primary and secondary NLDO.

External dacryocystorhinostomy **(EX-DCR)**
Transcanalicular laser dacryocystorhinostomy **(TC-DCR)**

Methods

❑Eligibility criteria:

PICOS QUESTION	
Population	Patients with Primary and Secondary Acquired Nasolacrimal Duct Obstruction (NLDO).
Intervention	Transcanalicular laser dacryocystorhinostomy (TC-DCR)
Comparison	External dacryocystorhinostomy (EX-DCR)
Outcome	1. **efficacy** (anatomical and functional success rates) 2. **safety** (intraoperative complications, postoperative complications, and surgical time)
Study	1. Randomized controlled trials (RCT) 2. Quasi-experimental studies 3. Observational studies

Table 2: Inclusion criteria

Methods

- This study is conducted according to a pre-specified PROSPERO (CRD42023260855) and reported using PRISMA guidelines.

- Information sources and **search strategy**:
  - Databases: MEDLINE, EMBASE, and CENTRAL, accessed by OVID.
  - Manual: Citations.

- Last search was on February 02, 2023.

Methods

❑Selection process

- **EndNote** was used to remove duplicates
- Two independent reviewers conducted title and abstract screening, followed by a full-text assessment of eligible studies.
- Discrepancies were resolved through consensus or discussion with a third reviewer.

❑ Data extraction

- Two reviewers, independently, performed data extraction from eligible studies using a pre-specified data collection sheet.
- Discrepancies were resolved through consensus or discussion with a third reviewer.

Methods

❑Quality assessment:

- **Risk of bias within studies:** JBI critical appraisal for observational studies and the revised Risk of Bias 2 (RoB 2) tool for randomized controlled trials.
- **Publication bias:** Visual inspection of the funnel plot.
- **Certainty of evidence:** GRADE criteria.

Methods

❑Meta-analysis:

- Random-effects model.
- Significance level: 95% with P-value <0.05 as a threshold.
- Effect measures: Risk Ratios.
- Heterogeneity: I^2 for heterogeneity and the P-value of Chi^2.

❑Subgroup analysis:

- Multi-diode and Single-diode TC-DCR for anatomical success and functional success.

Results: study characterstics

- Number of studies: 10 studies.
- Total number of participants: 709 patients.
- Intervention (Laser):
  - Multi-diode lasers: 6 studies
  - Single-diode: 4 studies
- Mean participant's age: 43.2 to 57.8 years.

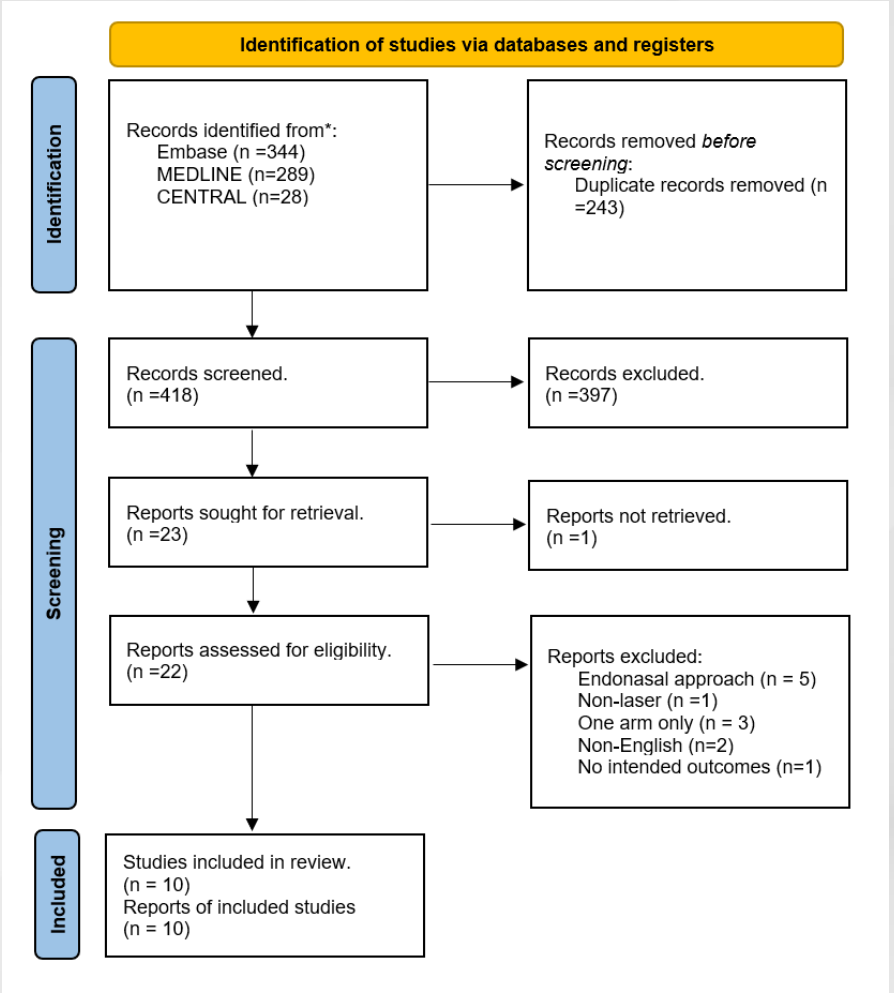

Figure 5: study flow diagram

Results: risk of bias and publication bias

- **Studies included in analysis:** 9 studies
- Low risk of bias: 5 studies.
- Moderate risk of bias: 2 studies.
- High risk of bias: 2 studies.

Observational studies quality assessment		
Domain	**Total**	**Overall risk of bias**
Bulut et al. 2021	6/11 (54%)	Moderate risk
Buttanri et al. 2014	7/11 (63.6%)	Moderate risk
Gomez et al. 2014	8/11 (72.7%)	Low risk
Mutlu et al. 2022	9/11 (81.8%)	Low risk
Yener et al. 2020	5/11 (45.4%)	High risk
Yilmaz et al. 2015	9/11 (81.8%)	Low risk
Quasi-experimental studies quality assessment		
Derya et al 2013	9/9 (100%)	Low risk
Yeniad et al. 2012	8/9 (88.8%)	Low risk
Randomized controlled trial quality assessment		
Mourya et al. 2017		High risk

Table 3: Risk of bias assessment

Results: meta-analysis

❑ Anatomical success

- Favorable for **EX-DCR**
  - significant heterogeneity I^2=67%. Significant P-value of Chi^2 = 0.01

❑Subgroup analysis:

- (RR = 0.75, 95% CI 0.55–1.02; P = 0.07; I^2 = 73%)
- Multidiode and Single diode TC-DRC
- **EX-DCR is better** than Multidiode, albeit not significant and high heterogeneity (P value= 0.07, I^2=73%)

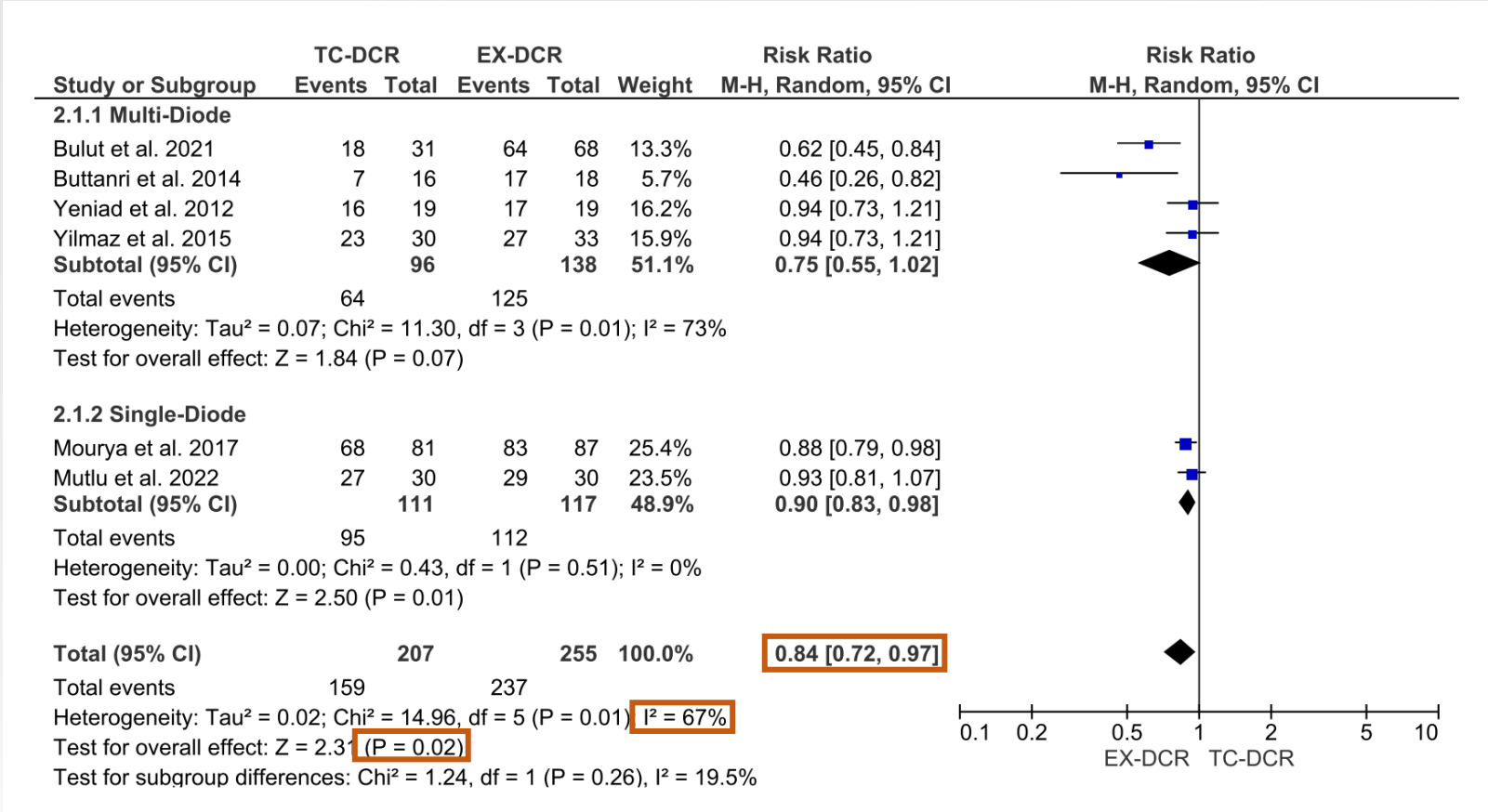

Figure 6: forest plot for Anatomical success rates

External dacryocystorhinostomy **(EX-DCR)**

Transcanalicular laser dacryocystorhinostomy **(TC-DCR)**

Results: meta-analysis

❑ Functional success

- Favorable for **EX-DCR**
  - Moderate heterogeneity I^2=44%. Not significant P-value of Chi^2 = 0.11

❑Subgroup analysis:

- (RR = 0.80, 95% CI 0.63–1.02; P = 0.07; I^2 = 61%)
- Multidiode TC-DRC
- **EX-DCR was superior** to Multidiode TC-DRC, albeit not significant and high heterogeneity (P value= 0.07, I^2=61%)

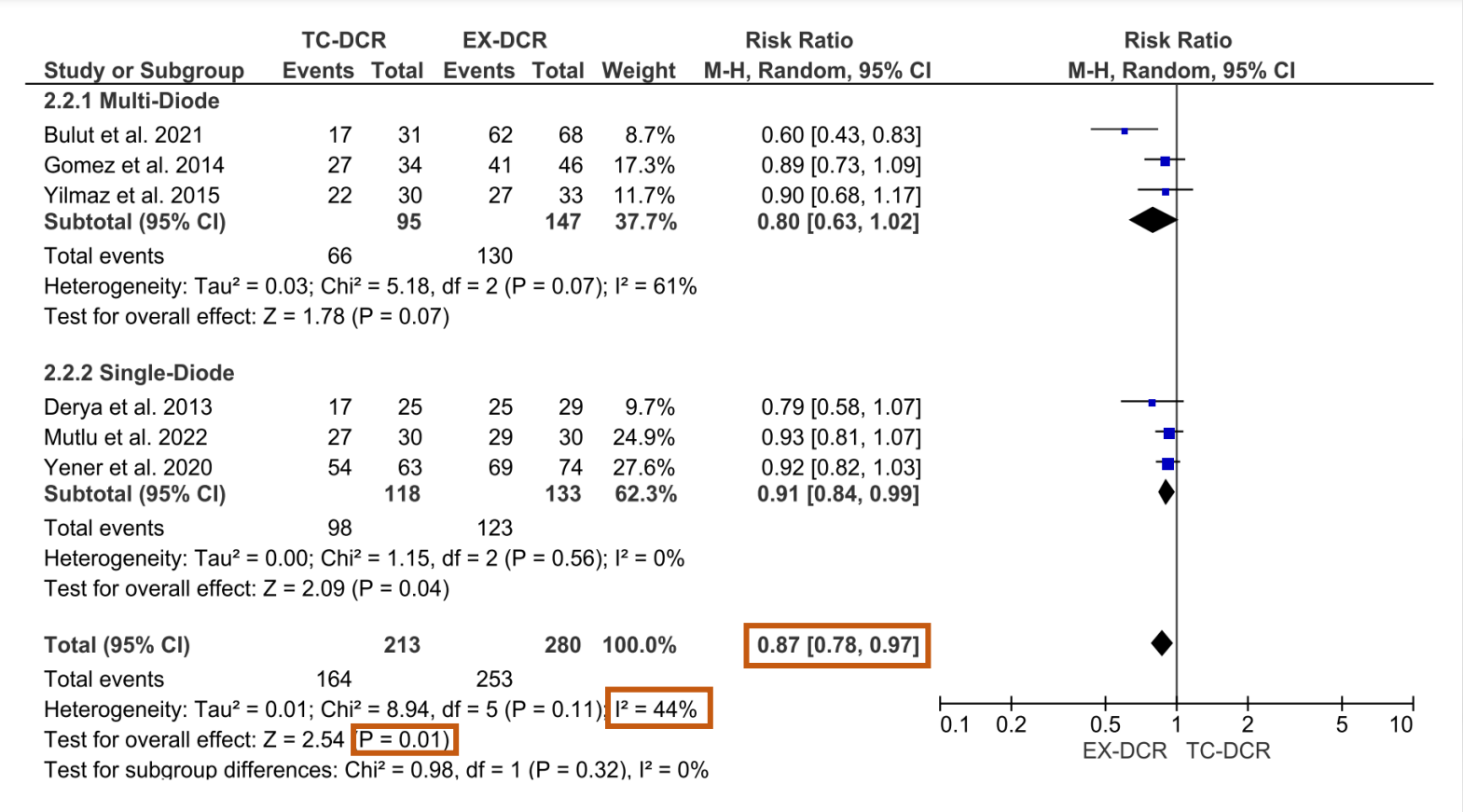

Figure 7: forest plot for Functional success rates
External dacryocystorhinostomy **(EX-DCR)**
Transcanalicular laser dacryocystorhinostomy **(TC-DCR)**

Results: meta-analysis

Outcomes	Superiority	Effect size	95% CI	P-value	I^2	GRADE
Anatomical Success	**EX-DRC** > TC-DRC	RR: 0.84	0.72–0.97	**0.02**	67%	**Low**
Functional success	**EX-DRC** > TC-DRC	RR: 0.87	0.78–0.97	**0.01**	**44%**	**Moderate**
Operative time	EX-DRC < **TC-DRC**	SMD: -2.42	-2.92 – -1.91	**< 0.00001**	**59%**	**Moderate**
Intraoperative Complications	EX-DRC < **TC-DRC**	RR: 0.16	0.06–0.43	**0.0003**	**0%**	**Low**
Postoperative Complications	EX-DRC > TC-DRC	RR: 1.44	0.55–3.78	0.46	65%	**Low**

Table 4: summary of the results of the meta-analysis

- **EX-DCR:** External dacryocystorhinostomy
- **TC-DCR:** Transcanalicular laser dacryocystorhinostomy
- **RR:** Risk Ratio
- **SMD:** Standard mean difference

Discussion

❑Summary of the evidence:

- **EX-DCR** demonstrated **significantly higher anatomical success rates** compared to TC-DCR, consistent with previous studies.
  - However, when comparing EX-DCR with Multidiode TC-DCR, there was **no statistically significant** difference in anatomical success.

- **EX-DCR** also **showed significantly better functional success rates** compared to TC-DCR, as supported by previous studies.
  - ➢ Contrary to our findings, some previous studies indicated that Multi-Diode TC-DCR and EX-DCR had **similar rates** of **success in both anatomical and functional outcomes.**

- **TC-DCR** showed advantages over EX-DCR with **significantly shorter operative time** and **fewer intraoperative complications**, as supported by previous studies.

Discussion

❑Strengths:

- Original meta-analysis.
- Our findings have raised the question of whether **Multidiode is superior to Single-Diode TC-DCR**, prompting the need for further investigation in this area.

❑ Limitations:

- Low number of high-quality RCTs
- Lack of Baseline Data
- Missing Ethnicity Information
  - Ethnicity may impact **anatomical variations** and affect **surgical outcomes**.

Conclusion

❑Implications on practice:

- **Choice of Technique:**
  - The findings suggest that **EX-DCR** may be the **preferred technique** for managing **NLDO** in terms of **anatomical and functional success rates**. However, TC-DCR has advantages in terms of shorter operative time and fewer intraoperative complications**.**

- **Individualized Approach:**
  - Clinicians should consider **patient-specific factors**, when selecting the appropriate technique.

❑ Implications on research:

- Future RCTs should implement a rigorous pre-study methodology and a sufficient follow-up period.

References

Thank You!

Ali Alsudais, Sixth-year Medical student, King Saud bin Abdulaziz University for health sciences, Jeddah, Saudi Arabia

Scan me!