Retrospective Cohort Study

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# Comparison of robotic versus thoracoscopic repair for congenital esophageal atresia: a propensity score matching analysis

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Centre de référence des affections chroniques et malformatives de l'œsophage

FIMATHO

Filière Santé Maladies Rares

# Contexte

- Thoracoscopie (TR) :
- 1999 : première Atrésie de l'œsophage par thoracoscospie *Lobe TE, Rotenberg SS et allPediatric Endosurg Innovat Tech. 1999*
- procédure de routine de nombreuses équipes
- Procédure efficace et sûre *Gustaf Drevin et al.Ann Surg.2021*
- Techniquement difficile, travail dans un petit espace, collaboration opérateur/aide
- Chirurgie robotique (RR):
- En plein développement en pédiatrie *Klein et al J Laparoscopi Adv Surg Tech 2007*
- Patient de plus en plus petit *Meehan JJ. J Laparoscopic Adv Surg Tech. 2009*
- Quelques case report d'atrésie de l'oesophage *Li S et all Surg Case rep.2021*

Première étude comparative entre la thorascopie et chirurgie robotique pour le traitement de l'atrésie de l'oesophage

# Matériel et Méthode

- Etude observationnelle rétrospectives multicentrique
- 3 centres chinois
- Aout 2020 et février 2023.
- Equipes expérimentées

-> chaque chirurgien : expérience minimum 100 cure d'Aoe par thoracoscopie et 100 chirurgies pédiatriques robot assistée

# Matériel et Méthode

- **Critère d'inclusion :**
- AO type C (classification de Gross)
- écart entre les 2 cul de sac inférieur à 3 vertèbres
- anastomose en 1 temps

- **Critères d'exclusion :**
- Détresse respiratoire
- Long gap
- Anastomose en en plusieurs temps
- AO type A, B, D et E

- **Appariement sur Score de propension 1:1**
- Indicateurs inclus dans le PSM : âge gestationnel, PN, et anomalies cardiovasculaires
- Indicateurs exclus du PSM : âge à la chirurgie et poids à la chirurgie

# Matériel et Méthode

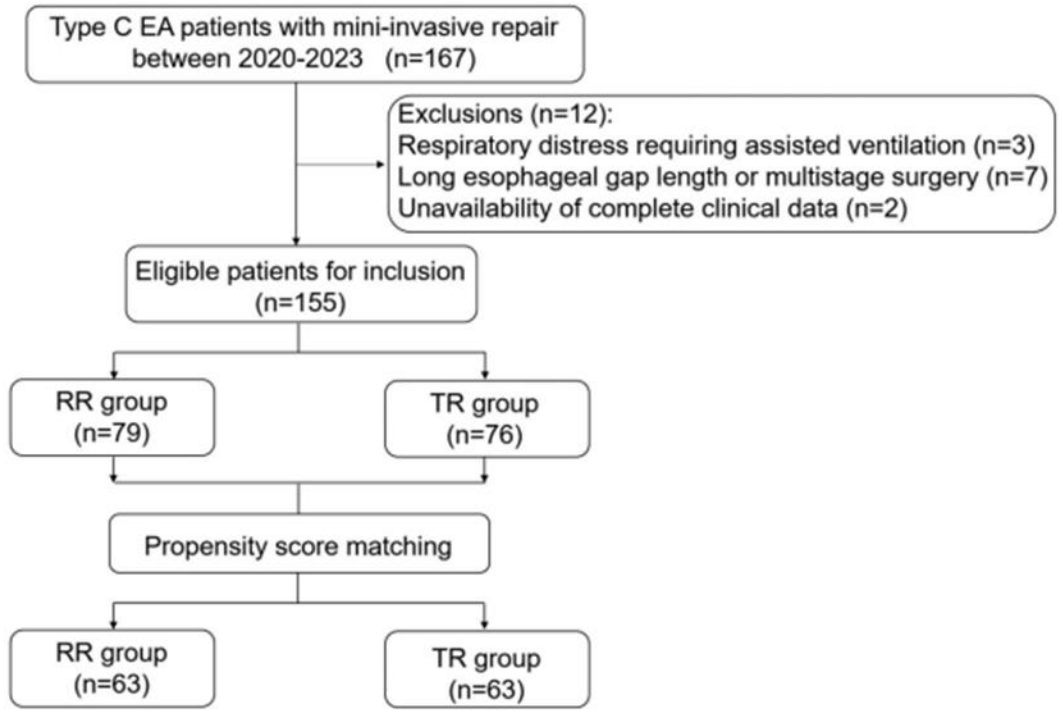



**Figure 2.** Flowchart of patient selection.

# Chirurgie Robot assistée


**Figure 4.** The positions of three trocars were asymmetrically distributed (A–C).

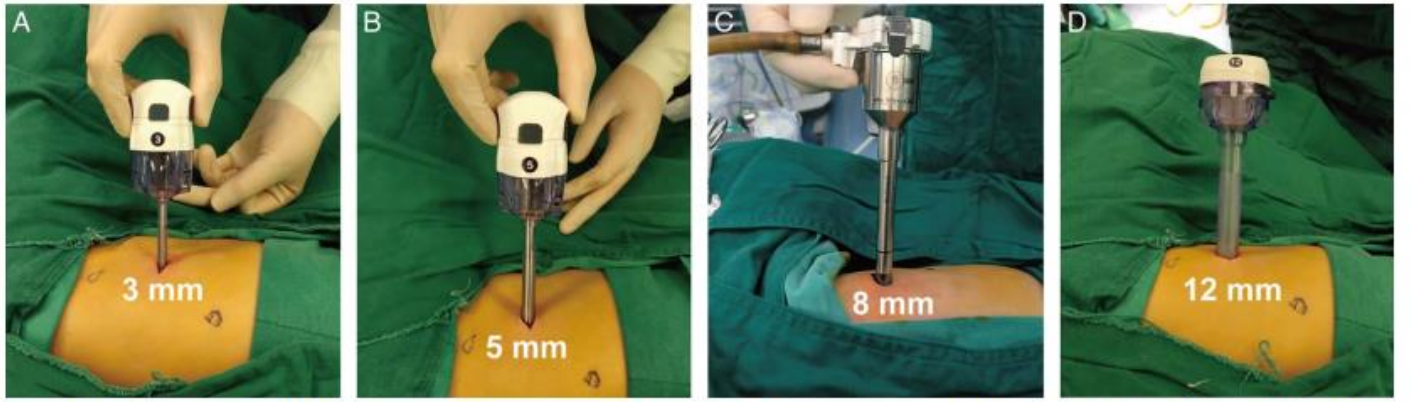
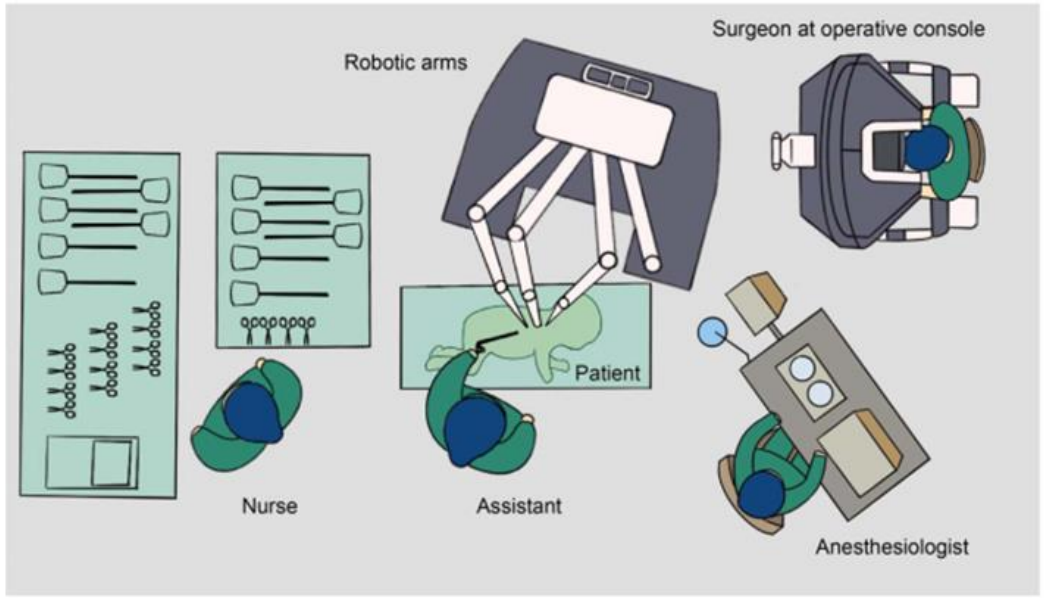



**Figure 5.** The step-trocar insertion technique: 3 mm (A), 5 mm (B), 8 mm (C), or 12 mm (D) trocars were inserted to gradually expand the operating channel to the target size.




- Trocart optique : 5ème EIC
- Trocarts opérateur 3ème et 8ème EIC avec distribution asymétrique non rectiligne
- Insufflation CO2 : 1l/min et 6 mmHg
- Technique d'insertion par étape des trocarts
- Exploration cavité thoracique/faisabilité de l'anastomose en 1 temps
- Coagulation/section azygos
- Ligature/suture de la fistule
- Anastomose plan postérieur 5,0 résorbables
- Insertion SNG
- Anastomose plan antérieur
- DT

# Résultats

**Table 2**

**Demographic data of the patients before and after PSM.**

| | Before PSM | | | | After PSM | | | |
|---|---|---|---|---|---|---|---|---|
| **Variable** | **RR ($n=79$)** | **TR ($n=76$)** | **Statistics** | ***P*** | **RR ($n=63$)** | **TR ($n=63$)** | **Statistics** | ***P*** |
| Sex (male) | 47 (59.49%) | 50 (65.79%) | $\chi^2=0.656$ | 0.418[c] | 39 (61.90%) | 41 (65.08%) | $\chi^2=0.137$ | 0.711[c] |
| Gestational age (weeks) | 36.55 ± 1.44 | 37.19 ± 1.82 | $t=2.437$ | 0.016[a] | 36.78 ± 1.44 | 36.87 ± 1.75 | $t=0.334$ | 0.739[a] |
| Birth weight (kg) | 2.59 ± 0.56 | 2.77 ± 0.46 | $t=2.235$ | 0.027[a] | 2.68 ± 0.52 | 2.67 ± 0.42 | $t=-0.159$ | 0.874[a] |
| Age at surgery (days) | 8.00 (5.00–13.00) | 3.00 (1.00–6.00) | $Z=-10.672$ | < 0.001[b] | 8.00 (5.00–12.00) | 3.00 (1.00–6.00) | $Z=-9.570$ | < 0.001[b] |
| Weight at surgery (kg) | 3.11 ± 0.54 | 2.95 ± 0.43 | $t=-2.095$ | 0.038[a] | 3.07 ± 0.50 | 2.87 ± 0.42 | $t=-2.373$ | 0.019[a] |
| Esophageal gap length (cm) | 1.73 ± 0.63 | 1.78 ± 0.37 | $t=0.620$ | 0.536[a] | 1.73 ± 0.61 | 1.79 ± 0.37 | $t=0.599$ | 0.550[a] |
| Associated anomalies | | | | | | | | |
| Cardiovascular (*n*, %) | 42 (53.16%) | 39 (51.32%) | $\chi^2=0.053$ | 0.818[c] | 35 (55.56%) | 35 (55.56%) | $\chi^2=0$ | 1.000[c] |
| Skeletal (*n*, %) | 9 (11.39%) | 8 (10.52%) | $\chi^2=0.030$ | 0.863[c] | 6 (9.52%) | 7 (11.11%) | $\chi^2=0.086$ | 0.770[c] |
| Gastrointestinal (*n*, %) | 10 (12.66%) | 10 (13.16%) | $\chi^2=0.009$ | 0.926[c] | 7 (11.11%) | 7 (11.11%) | $\chi^2=0$ | 1.000[c] |
| Preoperative pneumonia (*n*, %) | 23 (29.11%) | 17 (22.37%) | $\chi^2=0.921$ | 0.337[c] | 16 (25.40%) | 14 (22.22%) | $\chi^2=0.175$ | 0.676[c] |

[a]the Student's *t* test.
[b]the Mann–Whitney *U* test.
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| Birth weight (kg) | 2.59 ± 0.56 | 2.77 ± 0.46 | $t=2.235$ | 0.027[a] | 2.68 ± 0.52 | 2.67 ± 0.42 | $t=-0.159$ | 0.874[a] |
| Age at surgery (days) | 8.00 (5.00–13.00) | 3.00 (1.00–6.00) | $Z=-10.672$ | < 0.001[b] | 8.00 (5.00–12.00) | 3.00 (1.00–6.00) | $Z=-9.570$ | < 0.001[b] |
| Weight at surgery (kg) | 3.11 ± 0.54 | 2.95 ± 0.43 | $t=-2.095$ | 0.038[a] | 3.07 ± 0.50 | 2.87 ± 0.42 | $t=-2.373$ | 0.019[a] |
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| Preoperative pneumonia (*n*, %) | 23 (29.11%) | 17 (22.37%) | $\chi^2=0.921$ | 0.337[c] | 16 (25.40%) | 14 (22.22%) | $\chi^2=0.175$ | 0.676[c] |

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| Conversion ($n$, %) | 1 (1.27%) | 2 (2.63%) | $\chi^2=0.001$ | 0.973[c] | 1 (1.59%) | 1 (1.59%) | $\chi2=0$ | 1.000[c] |
| Intraoperative complications ($n$, %) | 0 | 0 | — | — | 0 | 0 | — | — |
| Operative time (min) | 173.85 ± 23.70 | 159.72 ± 14.76 | $t=-4.472$ | <0.001[a] | 173.81 ± 24.36 | 160.54 ± 14.78 | $t=-3.696$ | <0.001[a] |
| Anastomotic time (min) | 29.70 ± 3.15 | 40.71 ± 5.18 | $t=15.914$ | <0.001[a] | 29.52 ± 3.00 | 40.21 ± 5.00 | $t=14.541$ | <0.001[a] |
| Estimated operative blood loss (ml) | 4.00 (2.00—12.00) | 5.00 (2.00—18.00) | $Z=-1.767$ | 0.077[b] | 4.00 (2.00—10.00) | 5.00 (2.00—15.00) | $Z=-1.815$ | 0.070[b] |
| Time to feeding via nasogastric tube (days) | 3.00 (2.00—5.00) | 3.00 (2.00—5.00) | $Z=-1.747$ | 0.081[b] | 3.00 (2.00—4.00) | 3.00 (2.00—5.00) | $Z=-1.728$ | 0.084[b] |
| Time to oral feeding (days) | 12.00 (11.00—14.00) | 13.00 (11.00—15.00) | $Z=-1.615$ | 0.106[b] | 12.00 (11.00—13.00) | 13.00 (11.00—14.00) | $Z=-1.322$ | 0.186[b] |
| Time to extubation (days) | 1.00 (1.00—3.00) | 1.00 (1.00—3.00) | $Z=-1.068$ | 0.286[b] | 1.00 (1.00—2.00) | 1.00 (1.00—3.00) | $Z=-0.741$ | 0.459[b] |
| Length of hospital stay (days) | 17.71 ± 2.83 | 18.68 ± 3.92 | $t=1.770$ | 0.079[a] | 17.54 ± 2.90 | 18.63 ± 4.10 | $t=1.732$ | 0.086[a] |
| Follow-up time (months) | 21.00 (5.00—35.00) | 20.50 (5.00—35.00) | $Z=-0.183$ | 0.855[b] | 21.00 (5.00—35.00) | 20.00 (6.00—35.00) | $Z=-0.195$ | 0.845[b] |
| Severe hypercapnia ($n$, %) | 1 (1.27%) | 1 (1.32%) | — | 1.000[d] | 0 | 1 (1.59%) | — | 1.000[d] |
| Severe acidosis ($n$, %) | 0 | 0 | — | — | 0 | 0 | — | — |
| Surgical site infection ($n$, %) | 1 (1.27%) | 2 (2.63%) | $\chi^2=0.001$ | 0.973[c] | 0 | 1 (1.59%) | — | 1.000[d] |
| Vocal cord paresis ($n$, %) | 2 (2.53%) | 2 (2.63%) | $\chi^2=0$ | 1.000[c] | 0 | 1 (1.59%) | — | 1.000[d] |
| Pneumonia ($n$, %) | 23 (29.11%) | 24 (31.58%) | $\chi^2=0.111$ | 0.739[c] | 17 (26.98%) | 19 (30.16%) | $\chi2=0.156$ | 0.693[c] |
| Recurrent esophageal fistulas ($n$, %) | 2 (2.53%) | 4 (5.26%) | $\chi^2=0.216$ | 0.642[c] | 1 (1.59%) | 3 (4.76%) | $\chi2=0.258$ | 0.611[c] |
| Anastomotic leakage ($n$, %) | 6 (7.59%) | 16 (21.05%) | $\chi^2=5.760$ | 0.016[c] | 3 (4.76%) | 12 (19.05%) | $\chi2=6.130$ | 0.013[c] |
| Anastomotic stricture ($n$, %) | 14 (17.72%) | 24 (31.58%) | $\chi^2=4.019$ | 0.045[c] | 10 (15.87%) | 20 (31.74%) | $\chi2=4.375$ | 0.036[c] |

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[b]the Mann–Whitney $U$ test.
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| Operative time (min) | 173.85 ± 23.70 | 159.72 ± 14.76 | $t=-4.472$ | <0.001[a] | 173.81 ± 24.36 | 160.54 ± 14.78 | $t=-3.696$ | <0.001[a] |
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| Time to extubation (days) | 1.00 (1.00—3.00) | 1.00 (1.00—3.00) | $Z=-1.068$ | 0.286[b] | 1.00 (1.00—2.00) | 1.00 (1.00—3.00) | $Z=-0.741$ | 0.459[b] |
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| Follow-up time (months) | 21.00 (5.00—35.00) | 20.50 (5.00—35.00) | $Z=-0.183$ | 0.855[b] | 21.00 (5.00—35.00) | 20.00 (6.00—35.00) | $Z=-0.195$ | 0.845[b] |
| Severe hypercapnia (*n*, %) | 1 (1.27%) | 1 (1.32%) | — | 1.000[d] | 0 | 1 (1.59%) | — | 1.000[d] |
| Severe acidosis (*n*, %) | 0 | 0 | — | — | 0 | 0 | — | — |
| Surgical site infection (*n*, %) | 1 (1.27%) | 2 (2.63%) | $\chi^2=0.001$ | 0.973[c] | 0 | 1 (1.59%) | — | 1.000[d] |
| Vocal cord paresis (*n*, %) | 2 (2.53%) | 2 (2.63%) | $\chi^2=0$ | 1.000[c] | 0 | 1 (1.59%) | — | 1.000[d] |
| Pneumonia (*n*, %) | 23 (29.11%) | 24 (31.58%) | $\chi^2=0.111$ | 0.739[c] | 17 (26.98%) | 19 (30.16%) | $\chi2=0.156$ | 0.693[c] |
| Recurrent esophageal fistulas (*n*, %) | 2 (2.53%) | 4 (5.26%) | $\chi^2=0.216$ | 0.642[c] | 1 (1.59%) | 3 (4.76%) | $\chi2=0.258$ | 0.611[c] |
| Anastomotic leakage (*n*, %) | 6 (7.59%) | 16 (21.05%) | $\chi^2=5.760$ | 0.016[c] | 3 (4.76%) | 12 (19.05%) | $\chi2=6.130$ | 0.013[c] |
| Anastomotic stricture (*n*, %) | 14 (17.72%) | 24 (31.58%) | $\chi^2=4.019$ | 0.045[c] | 10 (15.87%) | 20 (31.74%) | $\chi2=4.375$ | 0.036[c] |

[a]the Student's *t* test.
[b]the Mann–Whitney *U* test.
[c]the $\chi2$ test.
[d]the Fisher's exact test.
Data: *n* (%), Mean ± SD or Median (Range); PSM, propensity score matching; RR, robotic repair; TR, thoracoscopic repair.

# Résultats

**Table 3**

**Intraoperative and short-term postoperative data of the patients before and after PSM.**

| | Before PSM | | | | After PSM | | | |
|---|---|---|---|---|---|---|---|---|
| **Variable** | **RR ($n=79$)** | **TR ($n=76$)** | **Statistics** | ***P*** | **RR ($n=63$)** | **TR ($n=63$)** | **Statistics** | ***P*** |
| Conversion ($n$, %) | 1 (1.27%) | 2 (2.63%) | $\chi^2=0.001$ | 0.973[c] | 1 (1.59%) | 1 (1.59%) | $\chi2=0$ | 1.000[c] |
| Intraoperative complications ($n$, %) | 0 | 0 | — | — | 0 | 0 | — | — |
| Operative time (min) | 173.85 ± 23.70 | 159.72 ± 14.76 | $t=-4.472$ | <0.001[a] | 173.81 ± 24.36 | 160.54 ± 14.78 | $t=-3.696$ | <0.001[a] |
| Anastomotic time (min) | 29.70 ± 3.15 | 40.71 ± 5.18 | $t=15.914$ | <0.001[a] | 29.52 ± 3.00 | 40.21 ± 5.00 | $t=14.541$ | <0.001[a] |
| Estimated operative blood loss (ml) | 4.00 (2.00—12.00) | 5.00 (2.00—18.00) | $Z=-1.767$ | 0.077[b] | 4.00 (2.00—10.00) | 5.00 (2.00—15.00) | $Z=-1.815$ | 0.070[b] |
| Time to feeding via nasogastric tube (days) | 3.00 (2.00—5.00) | 3.00 (2.00—5.00) | $Z=-1.747$ | 0.081[b] | 3.00 (2.00—4.00) | 3.00 (2.00—5.00) | $Z=-1.728$ | 0.084[b] |
| Time to oral feeding (days) | 12.00 (11.00—14.00) | 13.00 (11.00—15.00) | $Z=-1.615$ | 0.106[b] | 12.00 (11.00—13.00) | 13.00 (11.00—14.00) | $Z=-1.322$ | 0.186[b] |
| Time to extubation (days) | 1.00 (1.00—3.00) | 1.00 (1.00—3.00) | $Z=-1.068$ | 0.286[b] | 1.00 (1.00—2.00) | 1.00 (1.00—3.00) | $Z=-0.741$ | 0.459[b] |
| Length of hospital stay (days) | 17.71 ± 2.83 | 18.68 ± 3.92 | $t=1.770$ | 0.079[a] | 17.54 ± 2.90 | 18.63 ± 4.10 | $t=1.732$ | 0.086[a] |
| Follow-up time (months) | 21.00 (5.00—35.00) | 20.50 (5.00—35.00) | $Z=-0.183$ | 0.855[b] | 21.00 (5.00—35.00) | 20.00 (6.00—35.00) | $Z=-0.195$ | 0.845[b] |
| Severe hypercapnia ($n$, %) | 1 (1.27%) | 1 (1.32%) | — | 1.000[d] | 0 | 1 (1.59%) | — | 1.000[d] |
| Severe acidosis ($n$, %) | 0 | 0 | — | — | 0 | 0 | — | — |
| Surgical site infection ($n$, %) | 1 (1.27%) | 2 (2.63%) | $\chi^2=0.001$ | 0.973[c] | 0 | 1 (1.59%) | — | 1.000[d] |
| Vocal cord paresis ($n$, %) | 2 (2.53%) | 2 (2.63%) | $\chi^2=0$ | 1.000[c] | 0 | 1 (1.59%) | — | 1.000[d] |
| Pneumonia ($n$, %) | 23 (29.11%) | 24 (31.58%) | $\chi^2=0.111$ | 0.739[c] | 17 (26.98%) | 19 (30.16%) | $\chi2=0.156$ | 0.693[c] |
| Recurrent esophageal fistulas ($n$, %) | 2 (2.53%) | 4 (5.26%) | $\chi^2=0.216$ | 0.642[c] | 1 (1.59%) | 3 (4.76%) | $\chi2=0.258$ | 0.611[c] |
| Anastomotic leakage ($n$, %) | 6 (7.59%) | 16 (21.05%) | $\chi^2=5.760$ | 0.016[c] | 3 (4.76%) | 12 (19.05%) | $\chi2=6.130$ | 0.013[c] |
| Anastomotic stricture ($n$, %) | 14 (17.72%) | 24 (31.58%) | $\chi^2=4.019$ | 0.045[c] | 10 (15.87%) | 20 (31.74%) | $\chi2=4.375$ | 0.036[c] |

[a]the Student's $t$ test.
[b]the Mann–Whitney $U$ test.
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Data: $n$ (%), Mean ± SD or Median (Range); PSM, propensity score matching; RR, robotic repair; TR, thoracoscopic repair.

# Résultats

**Table 3**

**Intraoperative and short-term postoperative data of the patients before and after PSM.**

| | Before PSM | | | | After PSM | | | |
|---|---|---|---|---|---|---|---|---|
| **Variable** | **RR ($n=79$)** | **TR ($n=76$)** | **Statistics** | ***P*** | **RR ($n=63$)** | **TR ($n=63$)** | **Statistics** | ***P*** |
| Conversion ($n$, %) | 1 (1.27%) | 2 (2.63%) | $\chi^2=0.001$ | 0.973[c] | 1 (1.59%) | 1 (1.59%) | $\chi2=0$ | 1.000[c] |
| Intraoperative complications ($n$, %) | 0 | 0 | — | — | 0 | 0 | — | — |
| Operative time (min) | 173.85 ± 23.70 | 159.72 ± 14.76 | $t=-4.472$ | <0.001[a] | 173.81 ± 24.36 | 160.54 ± 14.78 | $t=-3.696$ | <0.001[a] |
| Anastomotic time (min) | 29.70 ± 3.15 | 40.71 ± 5.18 | $t=15.914$ | <0.001[a] | 29.52 ± 3.00 | 40.21 ± 5.00 | $t=14.541$ | <0.001[a] |
| Estimated operative blood loss (ml) | 4.00 (2.00—12.00) | 5.00 (2.00—18.00) | $Z=-1.767$ | 0.077[b] | 4.00 (2.00—10.00) | 5.00 (2.00—15.00) | $Z=-1.815$ | 0.070[b] |
| Time to feeding via nasogastric tube (days) | 3.00 (2.00—5.00) | 3.00 (2.00—5.00) | $Z=-1.747$ | 0.081[b] | 3.00 (2.00—4.00) | 3.00 (2.00—5.00) | $Z=-1.728$ | 0.084[b] |
| Time to oral feeding (days) | 12.00 (11.00—14.00) | 13.00 (11.00—15.00) | $Z=-1.615$ | 0.106[b] | 12.00 (11.00—13.00) | 13.00 (11.00—14.00) | $Z=-1.322$ | 0.186[b] |
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| Length of hospital stay (days) | 17.71 ± 2.83 | 18.68 ± 3.92 | $t=1.770$ | 0.079[a] | 17.54 ± 2.90 | 18.63 ± 4.10 | $t=1.732$ | 0.086[a] |
| Follow-up time (months) | 21.00 (5.00—35.00) | 20.50 (5.00—35.00) | $Z=-0.183$ | 0.855[b] | 21.00 (5.00—35.00) | 20.00 (6.00—35.00) | $Z=-0.195$ | 0.845[b] |
| Severe hypercapnia ($n$, %) | 1 (1.27%) | 1 (1.32%) | — | 1.000[d] | 0 | 1 (1.59%) | — | 1.000[d] |
| Severe acidosis ($n$, %) | 0 | 0 | — | — | 0 | 0 | — | — |
| Surgical site infection ($n$, %) | 1 (1.27%) | 2 (2.63%) | $\chi^2=0.001$ | 0.973[c] | 0 | 1 (1.59%) | — | 1.000[d] |
| ~~Vocal cord paresis ($n$, %)~~ | ~~2 (2.53%)~~ | ~~2 (2.63%)~~ | ~~$\chi^2=0$~~ | ~~1.000[c]~~ | ~~0~~ | ~~1 (1.59%)~~ | ~~—~~ | ~~1.000[d]~~ |
| Pneumonia ($n$, %) | 23 (29.11%) | 24 (31.58%) | $\chi^2=0.111$ | 0.739[c] | 17 (26.98%) | 19 (30.16%) | $\chi2=0.156$ | 0.693[c] |
| ~~Recurrent esophageal~~ fistulas ($n$, %) | ~~2 (2.53%)~~ | ~~4 (5.26%)~~ | ~~$\chi^2=0.216$~~ | ~~0.642[c]~~ | ~~1 (1.59%)~~ | ~~3 (4.76%)~~ | ~~$\chi2=0.258$~~ | ~~0.611[c]~~ |
| Anastomotic leakage ($n$, %) | 6 (7.59%) | 16 (21.05%) | $\chi^2=5.760$ | 0.016[c] | 3 (4.76%) | 12 (19.05%) | $\chi2=6.130$ | 0.013[c] |
| Anastomotic stricture ($n$, %) | 14 (17.72%) | 24 (31.58%) | $\chi^2=4.019$ | 0.045[c] | 10 (15.87%) | 20 (31.74%) | $\chi2=4.375$ | 0.036[c] |

[a]the Student's $t$ test.
[b]the Mann–Whitney $U$ test.
[c]the $\chi2$ test.
[d]the Fisher's exact test.
Data: $n$ (%), Mean ± SD or Median (Range); PSM, propensity score matching; RR, robotic repair; TR, thoracoscopic repair.

# Résultats

**Table 4**

**Long-term follow-up of children with EA during 2–3 years after surgery.**

| | Before PSM | | | | After PSM | | | |
|---|---|---|---|---|---|---|---|---|
| **Variable** | **RR ($n=35$)** | **TR ($n=33$)** | **Statistics** | ***P*** | **RR ($n=31$)** | **TR ($n=30$)** | **Statistics** | ***P*** |
| Dysphagia (*n*, %) | 9 (25.71%) | 8 (24.24%) | $\chi^2=0.020$ | 0.889[a] | 7 (22.58%) | 7 (23.33%) | $\chi^2=0.005$ | 0.944[a] |
| Gastroesophageal reflux (*n*, %) | 12 (34.29%) | 11 (33.33%) | $\chi^2=0.007$ | 0.934[a] | 10 (32.26%) | 9 (30.00%) | $\chi^2=0.036$ | 0.849[a] |
| Recurrent pneumonia (*n*, %) | 13 (37.14%) | 12 (36.36%) | $\chi^2=0.004$ | 0.947[a] | 10 (32.26%) | 11 (36.67%) | $\chi^2=0.131$ | 0.717[a] |
| Unplanned readmission (*n*, %) | 12 (34.29%) | 20 (60.61%) | $\chi^2=4.723$ | 0.030[a] | 10 (32.26%) | 18 (60.00%) | $\chi^2=4.725$ | 0.030[a] |
| Mortality (*n*, %) | 0 | 0 | — | — | 0 | 0 | — | — |

[a]the $\chi^2$ test.

Data: *n* (%); PSM, propensity score matching; RR, robotic repair; TR, thoracoscopic repair.

# Discussion

- Première étude comparative entre TR et RR
- Pas de complication respiratoires malgré la prise en charge chirurgicale différée
- Importance de l'installation des trocarts
- Diminution des fistules anastomotiques et sténoses : dextérité augmentée, précision de la dissection des culs de sac et de l'insertion des aiguilles pour les nœuds

MAIS

- Difficulté de l'absence de retour de force ?
- Accessibilité et cout du robot
- Etude retrospective, pas de randomisation, petite série, durée de suivi courte

# Conclusion

- La chirurgie robot assistée est une nouvelle option possible dans la cure des atrésie de l'œsophage
- Techniques pour pallier au contraintes d'installation du robot
- RR devient une procédure courante dans certains centres Chinois
- Et en France ?