

Multi-society consensus conference and guideline on the treatment of gastroesophageal reflux disease (GERD)

SUPPLEMENT 6: EVIDENCE TO DECISION TABLES FOR KEY QUESTION 4

4a. Should gastric bypass vs. fundoplication be used for patients with morbidly obesity (BMI >35) with concomitant GERD?

POPULATION:	Morbidly obese (BMI >35) patient with GERD
INTERVENTION:	Gastric bypass
COMPARISON:	Fundoplication
MAIN OUTCOMES:	Patient reported complete symptom resolution (within 2yrs) – Binary; Objective reflux recurrence (pH/impedance, EGD) – continuous; Perioperative complications (<30d) Clavien dindo ≥2 – yes/no;
SETTING:	
PERSPECTIVE:	PATIENT PERSPECTIVE
BACKGROUND:	
CONFLICT OF INTERESTS:	

ASSESSMENT

Problem																														
Is the problem a priority?																														
JUDGEMENT	RESEARCH EVIDENCE					ADDITIONAL CONSIDERATIONS																								
<input type="radio"/> No <input type="radio"/> Probably no <input type="radio"/> Probably yes <input checked="" type="radio"/> Yes <input type="radio"/> Varies <input type="radio"/> Don't know 100% yes 6/6																														
Desirable Effects																														
How substantial are the desirable anticipated effects?																														
JUDGEMENT	RESEARCH EVIDENCE					ADDITIONAL CONSIDERATIONS																								
<input type="radio"/> Trivial <input checked="" type="radio"/> Small <input type="radio"/> Moderate <input type="radio"/> Large <input type="radio"/> Varies <input type="radio"/> Don't know 100% small 6/6	One very small observational study showed that Gastric Bypass had increased patient-reported symptom resolution when compared to fundoplication.																													
	<table border="1"> <thead> <tr> <th>Outcomes</th> <th>No of participants (studies) Follow up</th> <th>Certainty of the evidence (GRADE)</th> <th>Relative effect (95% CI)</th> <th colspan="2">Anticipated absolute effects* (95% CI)</th> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <th>Risk with fundoplication</th> <th>Risk difference with gastric bypass</th> </tr> </thead> <tbody> <tr> <td>Patient reported complete symptom resolution (within 2yrs) – Binary</td> <td>100 (1 observational study)</td> <td>⊕○○○ VERY LOW^{a,b}</td> <td>RR 1.16 (1.03 to 1.30)</td> <td colspan="2">Study population</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td>848 per 1,000</td> <td>136 more per 1,000 (25 more to 254 more)</td> </tr> </tbody> </table>	Outcomes	No of participants (studies) Follow up	Certainty of the evidence (GRADE)	Relative effect (95% CI)	Anticipated absolute effects* (95% CI)						Risk with fundoplication	Risk difference with gastric bypass	Patient reported complete symptom resolution (within 2yrs) – Binary	100 (1 observational study)	⊕○○○ VERY LOW ^{a,b}	RR 1.16 (1.03 to 1.30)	Study population						848 per 1,000	136 more per 1,000 (25 more to 254 more)					
Outcomes	No of participants (studies) Follow up	Certainty of the evidence (GRADE)	Relative effect (95% CI)	Anticipated absolute effects* (95% CI)																										
				Risk with fundoplication	Risk difference with gastric bypass																									
Patient reported complete symptom resolution (within 2yrs) – Binary	100 (1 observational study)	⊕○○○ VERY LOW ^{a,b}	RR 1.16 (1.03 to 1.30)	Study population																										
				848 per 1,000	136 more per 1,000 (25 more to 254 more)																									

- a. There is significant imprecision as this is a single study with a small sample size and even smaller event size.
- b. There were significant baseline group differences that could affect the outcomes of interest that were not controlled for in their analysis. For example the Bypass group had a higher baseline BMI, which could affect their symptom resolution, however despite this factor, the Bypass group saw a higher rate of symptom resolution.

Undesirable Effects

How substantial are the undesirable anticipated effects?

JUDGEMENT	RESEARCH EVIDENCE	ADDITIONAL CONSIDERATIONS																						
<ul style="list-style-type: none"> ○ Large ● Moderate ○ Small ○ Trivial ○ Varies ○ Don't know <p>100% moderate 6/6</p>	<p>Fundoplication had a slightly lower mean postoperative DeMeester Score when compared with Gastric Bypass.</p> <p>Two studies comparing fundoplication and bypass evaluated perioperative complications, of which bypass had 2 patients with complications compared to none in the fundoplication group.</p> <table border="1"> <thead> <tr> <th rowspan="2">Outcomes</th> <th rowspan="2">No of participants (studies) Follow up</th> <th rowspan="2">Certainty of the evidence (GRADE)</th> <th rowspan="2">Relative effect (95% CI)</th> <th colspan="2">Anticipated absolute effects* (95% CI)</th> </tr> <tr> <th>Risk with fundoplication</th> <th>Risk difference with gastric bypass</th> </tr> </thead> <tbody> <tr> <td>Objective reflux recurrence (pH/impedance, EGD) – continuous assessed with: Mean Postoperative DeMeester Score</td> <td>8.54 (1 observational study)</td> <td>⊕○○○ VERY LOW^{a,b,c,d}</td> <td>-</td> <td>The mean objective reflux recurrence (pH/impedance, EGD) – continuous was 0</td> <td>MD 2.9 higher (1.6 higher to 4.28 higher)</td> </tr> <tr> <td rowspan="2">Perioperative complications (<30d) Clavien dindo ≥2 – yes/no</td> <td rowspan="2">112 (2 observational studies)</td> <td rowspan="2">⊕○○○ VERY LOW^{a,c}</td> <td rowspan="2">RR 18.18 (0.91 to 365.00)</td> <td colspan="2">Study population</td> </tr> <tr> <td>0 per 1,000</td> <td>0 fewer per 1,000 (0 fewer to 0 fewer)</td> </tr> </tbody> </table> <ul style="list-style-type: none"> a. There were several different, but conflicting, differences in baseline characteristics and symptoms that could affect outcomes that were not controlled for statistically within the study. b. For example, the Fundoplication group had a higher preoperative DeMeester score, yet despite this, they experienced a lower postoperative mean DeMeester score. c. There is significant imprecision as this is a single study with a small sample size and even smaller event size. d. In addition, the mean difference has a very wide confidence interval, contributing to its imprecision. 	Outcomes	No of participants (studies) Follow up	Certainty of the evidence (GRADE)	Relative effect (95% CI)	Anticipated absolute effects* (95% CI)		Risk with fundoplication	Risk difference with gastric bypass	Objective reflux recurrence (pH/impedance, EGD) – continuous assessed with: Mean Postoperative DeMeester Score	8.54 (1 observational study)	⊕○○○ VERY LOW ^{a,b,c,d}	-	The mean objective reflux recurrence (pH/impedance, EGD) – continuous was 0	MD 2.9 higher (1.6 higher to 4.28 higher)	Perioperative complications (<30d) Clavien dindo ≥2 – yes/no	112 (2 observational studies)	⊕○○○ VERY LOW ^{a,c}	RR 18.18 (0.91 to 365.00)	Study population		0 per 1,000	0 fewer per 1,000 (0 fewer to 0 fewer)	
Outcomes	No of participants (studies) Follow up					Certainty of the evidence (GRADE)	Relative effect (95% CI)	Anticipated absolute effects* (95% CI)																
		Risk with fundoplication	Risk difference with gastric bypass																					
Objective reflux recurrence (pH/impedance, EGD) – continuous assessed with: Mean Postoperative DeMeester Score	8.54 (1 observational study)	⊕○○○ VERY LOW ^{a,b,c,d}	-	The mean objective reflux recurrence (pH/impedance, EGD) – continuous was 0	MD 2.9 higher (1.6 higher to 4.28 higher)																			
Perioperative complications (<30d) Clavien dindo ≥2 – yes/no	112 (2 observational studies)	⊕○○○ VERY LOW ^{a,c}	RR 18.18 (0.91 to 365.00)	Study population																				
				0 per 1,000	0 fewer per 1,000 (0 fewer to 0 fewer)																			

Certainty of evidence

What is the overall certainty of the evidence of effects?

JUDGEMENT	RESEARCH EVIDENCE	ADDITIONAL CONSIDERATIONS												
<ul style="list-style-type: none"> ● Very low ○ Low ○ Moderate ○ High ○ No included studies <p>100% very low 6/6</p>	<table border="1"> <thead> <tr> <th>Outcomes</th> <th>Importance</th> <th>Certainty of the evidence (GRADE)</th> </tr> </thead> <tbody> <tr> <td>Patient reported complete symptom resolution (within 2yrs) – Binary</td> <td>CRITICAL</td> <td>⊕○○○ VERY LOW^{a,b}</td> </tr> <tr> <td>Objective reflux recurrence (pH/impedance, EGD) – continuous assessed with: Mean Postoperative DeMeester Score</td> <td>CRITICAL</td> <td>⊕○○○ VERY LOW^{a,c,d,e}</td> </tr> <tr> <td>Perioperative complications (<30d) Clavien dindo ≥2 – yes/no</td> <td>IMPORTANT</td> <td>⊕○○○ VERY LOW^{a,c}</td> </tr> </tbody> </table>	Outcomes	Importance	Certainty of the evidence (GRADE)	Patient reported complete symptom resolution (within 2yrs) – Binary	CRITICAL	⊕○○○ VERY LOW ^{a,b}	Objective reflux recurrence (pH/impedance, EGD) – continuous assessed with: Mean Postoperative DeMeester Score	CRITICAL	⊕○○○ VERY LOW ^{a,c,d,e}	Perioperative complications (<30d) Clavien dindo ≥2 – yes/no	IMPORTANT	⊕○○○ VERY LOW ^{a,c}	
Outcomes	Importance	Certainty of the evidence (GRADE)												
Patient reported complete symptom resolution (within 2yrs) – Binary	CRITICAL	⊕○○○ VERY LOW ^{a,b}												
Objective reflux recurrence (pH/impedance, EGD) – continuous assessed with: Mean Postoperative DeMeester Score	CRITICAL	⊕○○○ VERY LOW ^{a,c,d,e}												
Perioperative complications (<30d) Clavien dindo ≥2 – yes/no	IMPORTANT	⊕○○○ VERY LOW ^{a,c}												

	<ul style="list-style-type: none"> a. There is significant imprecision as this is a single study with a small sample size and even smaller event size. b. There were significant baseline group differences that could affect the outcomes of interest that were not controlled for in their analysis. For example the Bypass group had a higher baseline BMI, which could affect their symptom resolution, however despite this factor, the Bypass group saw a higher rate of symptom resolution. c. There were several different, but conflicting, differences in baseline characteristics and symptoms that could affect outcomes that were not controlled for statistically within the study. d. For example, the Fundoplication group had a higher preoperative DeMeester score, yet despite this, they experienced a lower postoperative mean DeMeester score. e. In addition, the mean difference has a very wide confidence interval, contributing to its imprecision. 	
--	---	--

Values

Is there important uncertainty about or variability in how much people value the main outcomes?

JUDGEMENT	RESEARCH EVIDENCE	ADDITIONAL CONSIDERATIONS
<ul style="list-style-type: none"> ● Important uncertainty or variability ○ Possibly important uncertainty or variability ○ Probably no important uncertainty or variability ○ No important uncertainty or variability 100% important uncertainty or variability 6/6 		<p>Value of weight loss in addition to the resolution of their GERD symptom resolution.</p> <p>Present for weight loss with GERD vs. present with terrible GERD with obesity.</p> <p>80% of bypass in women, usually more amenable and consider weight loss important to health</p> <p>In older patients with possibly more co-morbidities may be less likely to tolerate complications, whereas younger patients may need to have a more durable solution.</p> <p>People with other medical co-morbidities where typical GI absorption may become more important and have contraindications to a bypass.</p>

Balance of effects

Does the balance between desirable and undesirable effects favor the intervention or the comparison?

JUDGEMENT	RESEARCH EVIDENCE	ADDITIONAL CONSIDERATIONS
<ul style="list-style-type: none"> ○ Favors the comparison ○ Probably favors the comparison ● Does not favor either the intervention or the comparison ○ Probably favors the intervention ○ Favors the intervention ○ Varies ○ Don't know 100% either intervention or comparison 6/6 		<p>Small desirable effects and small undesirable effects</p>

Acceptability

Is the intervention acceptable to key stakeholders?

JUDGEMENT	RESEARCH EVIDENCE	ADDITIONAL CONSIDERATIONS
<ul style="list-style-type: none"> ○ No ○ Probably no ○ Probably yes ● Yes ○ Varies ○ Don't know 83% yes 5/6 		<p>Low complication rate is offset by potential benefits</p> <p>Bypass has possible increase durability and <i>long-term</i> symptom control</p>

Feasibility Is the intervention feasible to implement?		
JUDGEMENT	RESEARCH EVIDENCE	ADDITIONAL CONSIDERATIONS
<input type="radio"/> No <input type="radio"/> Probably no <input checked="" type="radio"/> Probably yes <input type="radio"/> Yes <input type="radio"/> Varies <input type="radio"/> Don't know 100% probably yes 6/6		Both Fundoplication and bypass require advanced surgical skills and equipment Ratio of patient:surgeon volume may make feasibility difficult Single anastomosis is currently most popular worldwide and thus may have difficulty introducing RYGB

SUMMARY OF JUDGEMENTS

	JUDGEMENT						
PROBLEM	No	Probably no	Probably yes	Yes		Varies	Don't know
DESIRABLE EFFECTS	Trivial	Small	Moderate	Large		Varies	Don't know
UNDESIRABLE EFFECTS	Large	Moderate	Small	Trivial		Varies	Don't know
CERTAINTY OF EVIDENCE	Very low	Low	Moderate	High			No included studies
VALUES	Important uncertainty or variability	Possibly important uncertainty or variability	Probably no important uncertainty or variability	No important uncertainty or variability			
BALANCE OF EFFECTS	Favors the comparison	Probably favors the comparison	Does not favor either the intervention or the comparison	Probably favors the intervention	Favors the intervention	Varies	Don't know
ACCEPTABILITY	No	Probably no	Probably yes	Yes		Varies	Don't know
FEASIBILITY	No	Probably no	Probably yes	Yes		Varies	Don't know

TYPE OF RECOMMENDATION

Strong recommendation against the intervention <input type="radio"/>	Conditional recommendation against the intervention <input type="radio"/>	Conditional recommendation for either the intervention or the comparison <input checked="" type="radio"/>	Conditional recommendation for the intervention <input type="radio"/>	Strong recommendation for the intervention <input type="radio"/>
---	--	---	--	---

Final rec: 5/6 (83.3%) either comparator or intervention (1/6 conditional intervention)

CONCLUSIONS

Recommendation

Justification

This statement applies to primary procedures.
This is looking exclusively at RYGB and does not apply to single anastomosis GB.

Subgroup considerations

Consideration for the patient that presents primarily for weight loss who happens to have GERD may have different priorities than the patient who presents with the chief complaint of refractory GERD.
For patients with increasing BMI, greater consideration should be given to bypass rather than fundoplication, regardless of co-morbid conditions.
In patients with significant medically co-morbidities, perhaps a fundoplication should be considered over bypass because although rare, when a complication occurs, they will have less reserve

Implementation considerations

Monitoring and evaluation

Research priorities

Study of patients with preoperative motility disorders, who undergo bypass for treatment of their GERD symptoms.
Efficacy of bypass in patients with atypical symptoms of GERD
RCT for bypass vs. fundoplication in patients with obesity and GERD
Long term outcome data is lacking
Data is lacking in patients with severe obesity
Use of endoscopic treatment of GERD in patients with obesity.

4c. Should Gastric Bypass vs. Redo Fundoplication be used for patients with morbid obesity (BMI >35) and GERD who have underwent previous fundoplication?

POPULATION:	Morbidly obese (BMI >35) patient with GERD who have underwent previous fundoplication
INTERVENTION:	Gastric Bypass
COMPARISON:	Redo Fundoplication
MAIN OUTCOMES:	Patient reported complete symptom resolution (within 2yrs) – yes/no; Patient reported symptom recurrence (<2yr and >2yr) – yes/no; Perioperative complications (<30d) Clavien dindo ≥2 – yes/no; Perioperative mortality (<30d); Reoperation Required, anytime; Hiatal hernia recurrence (>3cm and/or symptomatic) ; Dysphagia, requiring intervention; Need for anti-reflux medication;
SETTING:	
PERSPECTIVE:	PATIENT PERSPECTIVE
BACKGROUND:	
CONFLICT OF INTERESTS:	

ASSESSMENT

Problem																																		
Is the problem a priority?																																		
JUDGEMENT	RESEARCH EVIDENCE	ADDITIONAL CONSIDERATIONS																																
<ul style="list-style-type: none"> <input type="radio"/> No <input type="radio"/> Probably no <input type="radio"/> Probably yes <input checked="" type="radio"/> Yes <input type="radio"/> Varies <input type="radio"/> Don't know 100% yes 																																		
Desirable Effects																																		
How substantial are the desirable anticipated effects?																																		
JUDGEMENT	RESEARCH EVIDENCE	ADDITIONAL CONSIDERATIONS																																
<ul style="list-style-type: none"> <input type="radio"/> Trivial <input checked="" type="radio"/> Small <input type="radio"/> Moderate <input type="radio"/> Large <input type="radio"/> Varies <input type="radio"/> Don't know 100% small 	<p>Small number of observational studies comparing redo fundoplication to gastric bypass in obese patients that failed fundoplication.</p> <p>Bypass was favored over redo fundoplication in terms of hiatal hernia recurrence and need for ARM after surgery.</p> <p>The confidence interval is compatible clinically significant, albeit small, benefits to clinically significant, albeit small, harms for patient symptom resolution.</p> <table border="1"> <thead> <tr> <th rowspan="2">Outcomes</th> <th rowspan="2">No of participants (studies) Follow up</th> <th rowspan="2">Certainty of the evidence (GRADE)</th> <th rowspan="2">Relative effect (95% CI)</th> <th colspan="2">Anticipated absolute effects* (95% CI)</th> </tr> <tr> <th>Risk with Redo Fundoplication</th> <th>Risk difference with Gastric Bypass</th> </tr> </thead> <tbody> <tr> <td rowspan="2">Patient reported complete symptom resolution (within 2yrs) – yes/no</td> <td rowspan="2">483 (4 observational studies)</td> <td rowspan="2">⊕○○○ VERY LOW^{a,b}</td> <td rowspan="2">RR 1.00 (0.91 to 1.09)</td> <td colspan="2">Study population</td> </tr> <tr> <td>726 per 1,000</td> <td>0 fewer per 1,000 (65 fewer to 65 more)</td> </tr> <tr> <td rowspan="2">Hiatal hernia recurrence (>3cm and/or symptomatic)</td> <td rowspan="2">63 (1 observational study)</td> <td rowspan="2">⊕○○○ VERY LOW^{b,c,d}</td> <td rowspan="2">RR 0.64 (0.08 to 4.87)</td> <td colspan="2">Study population</td> </tr> <tr> <td>120 per 1,000</td> <td>43 fewer per 1,000 (110 fewer to 464 more)</td> </tr> <tr> <td rowspan="2">Need for anti-reflux medication</td> <td rowspan="2">152 (1 observational study)</td> <td rowspan="2">⊕○○○ VERY LOW^{b,d}</td> <td rowspan="2">RR 0.92 (0.42 to 2.01)</td> <td colspan="2">Study population</td> </tr> <tr> <td>182 per 1,000</td> <td>15 fewer per 1,000 (105 fewer to 184 more)</td> </tr> </tbody> </table> <p>a. Although 3 out of 4 studies were deemed to be low risk of bias, there was one study, Antiporda 2019, had an unclear risk of bias due to the fact that their groups had significant baseline characteristic differences and there was a large range in their follow up.</p> <p>b. There were a small number of patients included in this outcome measurement increasing the fragility of the results.</p> <p>c. This study had an unclear risk of bias due to differences in baseline characteristics that were not controlled for during the study.</p> <p>d. There is a wide confidence interval which increases the imprecision.</p>	Outcomes	No of participants (studies) Follow up	Certainty of the evidence (GRADE)	Relative effect (95% CI)	Anticipated absolute effects* (95% CI)		Risk with Redo Fundoplication	Risk difference with Gastric Bypass	Patient reported complete symptom resolution (within 2yrs) – yes/no	483 (4 observational studies)	⊕○○○ VERY LOW ^{a,b}	RR 1.00 (0.91 to 1.09)	Study population		726 per 1,000	0 fewer per 1,000 (65 fewer to 65 more)	Hiatal hernia recurrence (>3cm and/or symptomatic)	63 (1 observational study)	⊕○○○ VERY LOW ^{b,c,d}	RR 0.64 (0.08 to 4.87)	Study population		120 per 1,000	43 fewer per 1,000 (110 fewer to 464 more)	Need for anti-reflux medication	152 (1 observational study)	⊕○○○ VERY LOW ^{b,d}	RR 0.92 (0.42 to 2.01)	Study population		182 per 1,000	15 fewer per 1,000 (105 fewer to 184 more)	
Outcomes	No of participants (studies) Follow up					Certainty of the evidence (GRADE)	Relative effect (95% CI)	Anticipated absolute effects* (95% CI)																										
		Risk with Redo Fundoplication	Risk difference with Gastric Bypass																															
Patient reported complete symptom resolution (within 2yrs) – yes/no	483 (4 observational studies)	⊕○○○ VERY LOW ^{a,b}	RR 1.00 (0.91 to 1.09)	Study population																														
				726 per 1,000	0 fewer per 1,000 (65 fewer to 65 more)																													
Hiatal hernia recurrence (>3cm and/or symptomatic)	63 (1 observational study)	⊕○○○ VERY LOW ^{b,c,d}	RR 0.64 (0.08 to 4.87)	Study population																														
				120 per 1,000	43 fewer per 1,000 (110 fewer to 464 more)																													
Need for anti-reflux medication	152 (1 observational study)	⊕○○○ VERY LOW ^{b,d}	RR 0.92 (0.42 to 2.01)	Study population																														
				182 per 1,000	15 fewer per 1,000 (105 fewer to 184 more)																													

Undesirable Effects

How substantial are the undesirable anticipated effects?

JUDGEMENT	RESEARCH EVIDENCE	ADDITIONAL CONSIDERATIONS																																																
<p>○ Large ● Moderate ○ Small ○ Trivial ○ Varies ○ Don't know</p> <p>100% moderate</p>	<p>The Bypass group saw a higher rate of symptom recurrence, higher rate of perioperative complications, lower rates of hiatal hernia recurrence, and higher 30d mortality. Although bypass group only had one mortality across all studies, this was in contrast to zero patient deaths in the fundoplication group.</p> <p>The Bypass group had a significantly higher rate of reoperation.</p> <table border="1" data-bbox="306 370 1667 1102"> <thead> <tr> <th rowspan="2">Outcomes</th> <th rowspan="2">№ of participants (studies) Follow up</th> <th rowspan="2">Certainty of the evidence (GRADE)</th> <th rowspan="2">Relative effect (95% CI)</th> <th colspan="2">Anticipated absolute effects* (95% CI)</th> </tr> <tr> <th>Risk with Redo Fundoplication</th> <th>Risk difference with Gastric Bypass</th> </tr> </thead> <tbody> <tr> <td rowspan="2">Patient reported symptom recurrence (<2yr and >2yr) – yes/no</td> <td rowspan="2">180 (1 observational study)</td> <td rowspan="2">⊕○○○ VERY LOW^{a,b}</td> <td rowspan="2">RR 1.33 (0.64 to 2.74)</td> <td colspan="2">Study population</td> </tr> <tr> <td>127 per 1,000</td> <td>42 more per 1,000 (46 fewer to 220 more)</td> </tr> <tr> <td rowspan="2">Perioperative complications (<30d) Clavien dindo ≥2 – yes/no</td> <td rowspan="2">515 (4 observational studies)</td> <td rowspan="2">⊕○○○ VERY LOW^{a,c}</td> <td rowspan="2">RR 1.44 (0.89 to 2.32)</td> <td colspan="2">Study population</td> </tr> <tr> <td>118 per 1,000</td> <td>52 more per 1,000 (13 fewer to 155 more)</td> </tr> <tr> <td rowspan="2">Perioperative mortality (<30d)</td> <td rowspan="2">698 (5 observational studies, only one contributed mortality data)</td> <td rowspan="2">⊕○○○ VERY LOW^{a,b,d}</td> <td rowspan="2">-</td> <td colspan="2">Study population</td> </tr> <tr> <td>0/442 (0.0%)</td> <td>1/256 (0.4%)</td> </tr> <tr> <td rowspan="2">Reoperation Required, anytime</td> <td rowspan="2">363 (3 observational studies)</td> <td rowspan="2">⊕○○○ VERY LOW^{a,b}</td> <td rowspan="2">RR 6.09 (2.00 to 18.56)</td> <td colspan="2">Study population</td> </tr> <tr> <td>19 per 1,000</td> <td>96 more per 1,000 (19 more to 330 more)</td> </tr> <tr> <td rowspan="2">Dysphagia, requiring intervention</td> <td rowspan="2">303 (2 observational studies)</td> <td rowspan="2">⊕○○○ VERY LOW^{a,b,e,f}</td> <td rowspan="2">RR 0.61 (0.00 to 459.61)</td> <td colspan="2">Study population</td> </tr> <tr> <td>133 per 1,000</td> <td>52 fewer per 1,000 (133 fewer to 60,997 more)</td> </tr> </tbody> </table> <p>a. There were a small number of patients included in this outcome measurement increasing the fragility of the results. b. There is a wide confidence interval which increases the imprecision. c. Although 3 out of 4 studies were deemed to be low risk of bias, there was one study, Antiporda 2019, had an unclear risk of bias due to the fact that their groups had significant baseline characteristic differences and there was a large range in their follow up. d. Two of the included studies had an unclear risk of bias. One study changed their surgical approach over the course of the study period and the other did not statistically control for differences in their study groups' baseline characteristics. In addition, only one study contributed mortality data and that study was one with an unclear risk of bias. e. One of the two studies had an unclear risk of bias due to the surgical approach changing over the course of the study period. f. There was a large amount of heterogeneity between these two studies, even so far as to have opposite findings. One study found a higher rate of dysphagia requiring intervention in the bypass group, whereas the other found a higher rate in the redo fundoplication group.</p>	Outcomes	№ of participants (studies) Follow up	Certainty of the evidence (GRADE)	Relative effect (95% CI)	Anticipated absolute effects* (95% CI)		Risk with Redo Fundoplication	Risk difference with Gastric Bypass	Patient reported symptom recurrence (<2yr and >2yr) – yes/no	180 (1 observational study)	⊕○○○ VERY LOW ^{a,b}	RR 1.33 (0.64 to 2.74)	Study population		127 per 1,000	42 more per 1,000 (46 fewer to 220 more)	Perioperative complications (<30d) Clavien dindo ≥2 – yes/no	515 (4 observational studies)	⊕○○○ VERY LOW ^{a,c}	RR 1.44 (0.89 to 2.32)	Study population		118 per 1,000	52 more per 1,000 (13 fewer to 155 more)	Perioperative mortality (<30d)	698 (5 observational studies, only one contributed mortality data)	⊕○○○ VERY LOW ^{a,b,d}	-	Study population		0/442 (0.0%)	1/256 (0.4%)	Reoperation Required, anytime	363 (3 observational studies)	⊕○○○ VERY LOW ^{a,b}	RR 6.09 (2.00 to 18.56)	Study population		19 per 1,000	96 more per 1,000 (19 more to 330 more)	Dysphagia, requiring intervention	303 (2 observational studies)	⊕○○○ VERY LOW ^{a,b,e,f}	RR 0.61 (0.00 to 459.61)	Study population		133 per 1,000	52 fewer per 1,000 (133 fewer to 60,997 more)	
Outcomes	№ of participants (studies) Follow up					Certainty of the evidence (GRADE)	Relative effect (95% CI)	Anticipated absolute effects* (95% CI)																																										
		Risk with Redo Fundoplication	Risk difference with Gastric Bypass																																															
Patient reported symptom recurrence (<2yr and >2yr) – yes/no	180 (1 observational study)	⊕○○○ VERY LOW ^{a,b}	RR 1.33 (0.64 to 2.74)	Study population																																														
				127 per 1,000	42 more per 1,000 (46 fewer to 220 more)																																													
Perioperative complications (<30d) Clavien dindo ≥2 – yes/no	515 (4 observational studies)	⊕○○○ VERY LOW ^{a,c}	RR 1.44 (0.89 to 2.32)	Study population																																														
				118 per 1,000	52 more per 1,000 (13 fewer to 155 more)																																													
Perioperative mortality (<30d)	698 (5 observational studies, only one contributed mortality data)	⊕○○○ VERY LOW ^{a,b,d}	-	Study population																																														
				0/442 (0.0%)	1/256 (0.4%)																																													
Reoperation Required, anytime	363 (3 observational studies)	⊕○○○ VERY LOW ^{a,b}	RR 6.09 (2.00 to 18.56)	Study population																																														
				19 per 1,000	96 more per 1,000 (19 more to 330 more)																																													
Dysphagia, requiring intervention	303 (2 observational studies)	⊕○○○ VERY LOW ^{a,b,e,f}	RR 0.61 (0.00 to 459.61)	Study population																																														
				133 per 1,000	52 fewer per 1,000 (133 fewer to 60,997 more)																																													

Certainty of evidence

What is the overall certainty of the evidence of effects?

JUDGEMENT	RESEARCH EVIDENCE			ADDITIONAL CONSIDERATIONS
<p>● Very low</p> <p>○ Low</p> <p>○ Moderate</p> <p>○ High</p> <p>○ No included studies</p> <p>100% very low</p>	Outcomes	Importance	Certainty of the evidence (GRADE)	
	Patient reported complete symptom resolution (within 2yrs) – yes/no	CRITICAL	⊕○○○ VERY LOW ^{a,b}	
	Patient reported symptom recurrence (<2yr and >2yr) – yes/no	CRITICAL	⊕○○○ VERY LOW ^{b,c}	
	Perioperative complications (<30d) Clavien dindo ≥2 – yes/no	IMPORTANT	⊕○○○ VERY LOW ^{a,b}	
	Perioperative mortality (<30d)	IMPORTANT	⊕○○○ VERY LOW ^{b,c,d}	
	Reoperation Required, anytime	IMPORTANT	⊕○○○ VERY LOW ^{b,c}	
	Hiatal hernia recurrence (>3cm and/or symptomatic)	NOT IMPORTANT	⊕○○○ VERY LOW ^{b,c,e}	
	Dysphagia, requiring intervention	NOT IMPORTANT	⊕○○○ VERY LOW ^{b,c,f,g}	
	Need for anti-reflux medication	NOT IMPORTANT	⊕○○○ VERY LOW ^{b,c}	
<p>a. Although 3 out of 4 studies were deemed to be low risk of bias, there was one study, Antiporda 2019, had an unclear risk of bias due to the fact that their groups had significant baseline characteristic differences and there was a large range in their follow up.</p> <p>b. There were a small number of patients included in this outcome measurement increasing the fragility of the results.</p> <p>c. There is a wide confidence interval which increases the imprecision.</p> <p>d. Two of the included studies had an unclear risk of bias. One study changed their surgical approach over the course of the study period and the other did not statistically control for differences in their study groups' baseline characteristics. In addition, only one study contributed mortality data and that study was one with an unclear risk of bias.</p> <p>e. This study had an unclear risk of bias due to differences in baseline characteristics that were not controlled for during the study.</p> <p>f. One of the two studies had an unclear risk of bias due to the surgical approach changing over the course of the study period.</p> <p>g. There was a large amount of heterogeneity between these two studies, even so far as to have opposite findings. One study found a higher rate of dysphagia requiring intervention in the bypass group, whereas the other found a higher rate in the redo fundoplication group.</p>				

Values

Is there important uncertainty about or variability in how much people value the main outcomes?

JUDGEMENT	RESEARCH EVIDENCE	ADDITIONAL CONSIDERATIONS
<ul style="list-style-type: none">● Important uncertainty or variability○ Possibly important uncertainty or variability○ Probably no important uncertainty or variability○ No important uncertainty or variability100% important uncertainty or variability		Multiple redo fundoplication More severe obesity may put a greater priority on weight loss Technical reasons for Nissen failure, such as hiatal hernia

Balance of effects

Does the balance between desirable and undesirable effects favor the intervention or the comparison?

JUDGEMENT	RESEARCH EVIDENCE	ADDITIONAL CONSIDERATIONS
<ul style="list-style-type: none">○ Favors the comparison○ Probably favors the comparison○ Does not favor either the intervention or the comparison○ Probably favors the intervention○ Favors the intervention○ Varies○ Don't know100% probably comparator		

Acceptability

Is the intervention acceptable to key stakeholders?

JUDGEMENT	RESEARCH EVIDENCE	ADDITIONAL CONSIDERATIONS
<ul style="list-style-type: none">○ No○ Probably no● Probably yes○ Yes○ Varies○ Don't know80% (4/5) probably yes(1/5 yes)		Consideration for multiple redo's vs. first revisional surgery Multiple redo may be even more likely to fail another fundoplication

Feasibility

Is the intervention feasible to implement?

JUDGEMENT	RESEARCH EVIDENCE	ADDITIONAL CONSIDERATIONS
<ul style="list-style-type: none">○ No○ Probably no● Probably yes○ Yes○ Varies○ Don't know80% (4/5) probably yes(1/5 yes)		Revisional surgery requires advanced skills at specialized centers

SUMMARY OF JUDGEMENTS

	JUDGEMENT						
PROBLEM	No	Probably no	Probably yes	Yes		Varies	Don't know
DESIRABLE EFFECTS	Trivial	Small	Moderate	Large		Varies	Don't know
UNDESIRABLE EFFECTS	Large	Moderate	Small	Trivial		Varies	Don't know
CERTAINTY OF EVIDENCE	Very low	Low	Moderate	High			No included studies
VALUES	Important uncertainty or variability	Possibly important uncertainty or variability	Probably no important uncertainty or variability	No important uncertainty or variability			
BALANCE OF EFFECTS	Favors the comparison	Probably favors the comparison	Does not favor either the intervention or the comparison	Probably favors the intervention	Favors the intervention	Varies	Don't know
ACCEPTABILITY	No	Probably no	Probably yes	Yes		Varies	Don't know
FEASIBILITY	No	Probably no	Probably yes	Yes		Varies	Don't know

TYPE OF RECOMMENDATION

Strong recommendation against the intervention <input type="radio"/>	Conditional recommendation against the intervention <input type="radio"/>	Conditional recommendation for either the intervention or the comparison <input checked="" type="radio"/>	Conditional recommendation for the intervention <input type="radio"/>	Strong recommendation for the intervention <input type="radio"/>
---	--	--	--	---

Final Rec: 4/5 (80%) Either, 1/5 for intervention

CONCLUSIONS

Recommendation

In general, you can do either, but in expert opinion, if more than one fundoplication has been attempted and failed then the panel would recommend bypass.

Justification

Although the bypass group had a significantly higher re-operative rate, in several papers those patients had already undergone multiple revisional operations prior to their bypass.

Subgroup considerations

Patients who have already undergone multiple revisions, more consideration should be given to bypass

Patients with a higher BMI should consider bypass

Patients with delayed gastric emptying should consider bypass

Implementation considerations

Monitoring and evaluation

Research priorities

RCT of redo fundoplication vs. bypass or at minimum matched comparative studies
Preoperative esophageal and gastric motility and gastric emptying testing after intervention for failed fundoplication