Routine preoperative diagnosis of hiatal hernia: is it useful?

Fabrizio REBECCHI

Department of Surgical Sciences
Centre of Mini-Invasive Surgery
(Head: Prof. Mario MORINO)
University of Turin, Italy

> Surg Obes Relat Dis. 2013 Nov-Dec;9(6):920-4. doi: 10.1016/j.soard.2013.03.013.
Epub 2013 Apr 19.

Prevalence of hiatal hernia in the morbidly obese

Fredrick Che [1], Brian Nguyen, Allen Cohen, Ninh T Nguyen

> Surg Obes Relat Dis. 2011 Nov-Dec;7(6):749-59. doi: 10.1016/j.soard.2011.07.017.
Epub 2011 Aug 10.

Third International Summit: Current status of sleeve gastrectomy

Mervyn Deitel [1], Michel Gagner, Ann L Erickson, Rose D Crosby

> Surg Obes Relat Dis. 2018 May;14(5):693-699. doi: 10.1016/j.soard.2018.01.009.
Epub 2018 Jan 12.

The impact of preoperative investigations on the management of bariatric patients; results of a cohort of more than 1200 cases

Romano Schneider [1], Ioannis Lazaridis [2], Marko Kraljević [2], Christoph Beglinger [3], Bettina Wölnerhanssen [3], Ralph Peterli [2]

BARIATRIC SURGERY and HIATAL HERNIA

Pre-operative evaluation

AGENDA

- Clinical practice guidelines
- Diagnostic value of routine preoperative work-up
- Impact of routine preoperative HH diagnosis both on surgical techniques and on costs-effectiveness consideration

Clinical practice guidelines

Surgical Endoscopy
https://doi.org/10.1007/s00464-020-07555-y

GUIDELINES

Clinical practice guidelines of the European Association for Endoscopic Surgery (EAES) on bariatric surgery: update 2020 endorsed by IFSO-EC, EASO and ESPCOP

Nicola Di Lorenzo[1] · Stavros A. Antoniou[2,3] · Rachel L. Batterham[4,5] · Luca Busetto[6] · Daniela Godoroja[7] · Angelo Iossa[8] · Francesco M. Carrano[9] · Ferdinando Agresta[10] · Isaias Alarçon[11] · Carmil Azran[12] · Nicole Bouvy[13] · Carmen Balaguè Ponz[14] · Maura Buza[15] · Catalin Copaescu[15] · Maurizio De Luca[16] · Dror Dicker[17] · Angelo Di Vincenzo[6] · Daniel M. Felsenreich[18] · Nader K. Francis[19] · Martin Fried[20] · Berta Gonzalo Prats[14] · David Goitein[21] · Jason C. G. Halford[22,23] · Jitka Herlesova[20] · Marina Kalogridaki[24] · Hans Ket[25] · Salvador Morales-Conde[11] · Giacomo Piatto[16] · Gerhard Prager[18] · Suzanne Pruijssers[13] · Andrea Pucci[4,5] · Shlomi Rayman[21] · Eugenia Romano[22,23] · Sergi Sanchez-Cordero[26] · Ramon Vilallonga[27] · Gianfranco Silecchia[8]

Preoperative endoscopy versus no endoscopy in patients undergoing bariatric surgery?

Esophagogastroscopy can be considered as routine diagnostic test prior to bariatric surgery
Conditional recommendation

ASMBS Guidelines/Statements

ASMBS position statement on the rationale for performance of upper gastrointestinal endoscopy before and after metabolic and bariatric surgery

Guilherme M. Campos M.D., Ph.D., F.A.S.M.B.S., F.A.C.S. [a],
Guilherme S. Mazzini M.D., Ph.D. [a], Maria S. Altieri M.D., M.S. [b],
Salvatore Docimo Jr. D.O., F.A.S.M.B.S., F.A.C.S. [c], Eric J. DeMaria M.D., F.A.S.M.B.S., F.A.C.S. [b],
Ann M. Rogers M.D., F.A.S.M.B.S., F.A.C.S. [d],
Clinical Issues Committee of the American Society for Metabolic and Bariatric Surgery

Surgery for Obesity and Related Diseases

Preoperative endoscopy versus no endoscopy in patients udergoing bariatric surgery?

Upper endoscopy only in symptomatic patients preoperatively

Diagnostic role of routine preoperative work-up

OPTIONS FOR ROUTINE PRE-OPERATIVE HIATAL HERNIA EVALUATION

. UPPER GASTROINTESTINAL SERIES (UGI)

. UPPER ENDOSCOPY

. HIGH RESOLUTION MANOMETRY (HRM)

META ANALYSIS AND SYSTEMATIC REVIEW

Diagnostic value of X-ray, endoscopy, and high-resolution manometry for hiatal hernia: A systematic review and meta-analysis

Lunan Li,*,‡ Huiqin Gao,‡ Chenjing Zhang,* Jiangfeng Tu,* Xiaoge Geng,* Jingya Wang,* Xiaolu Zhou,* Wensheng Pan* and Jiyong Jing†

Journal of Gastroenterology and Hepatology **35** (2020) 13–18

Studies were included when both of the following conditions were met:
a) Surgery was chosen as the gold standard, and
b) Sufficient data were reported to calculate true positive (TP), false positive (FP), false negative (FN), and true negative (TN).

Table 2 The TP, FP, FN, TN, pooled sensitivity, pooled specificity, and heterogeneity analysis information in this meta-analysis

Diagnosis method	Author	Year	TP	FP	FN	TN	Index†	Reftest‡	Subject§	Surgical reason¶	Pooled sensitivity	Pooled specificity
X-ray	Heacock *et al.*	2012	99	46	51	192	1	0	0	1	0.63 (0.46–0.77)	0.85 (0.69–0.94)
	Broucek *et al.*	2014	32	32	31	51	0	0	1	1		
	Goitein *et al.*	2017	65	150	112	2090	0	0	0	1		
	Tuerdi *et al.*	2018	85	8	15	22	1	1	1	0		
	Tolone *et al.*	2018	37	1	16	46	1	1	1	0		
Endoscopy	Khajanchee *et al.*	2013	23	13	19	28	1	1	0	0	0.72 (0.39–0.91)	0.80 (0.70–0.87)
	Mohammed *et al.*	2017	204	230	56	1080	0	0	0	1		
	Tuerdi *et al.*	2018	34	5	66	25	1	1	1	0		
	Tolone *et al.*	2018	51	12	2	35	1	1	1	0		
High-resolution manometry	Khajanchee *et al.*	2013	22	2	20	39	1	1	0	0	0.77 (0.70–0.83)	0.92 (0.85–0.96)
	Tuerdi *et al.*	2018	78	4	22	26	1	1	1	0		
	Tolone *et al.*	2018	50	4	3	43	1	1	1	0		

5 articles: 3181 pt

4 articles: 1883 pt

3 articles: 313 pt

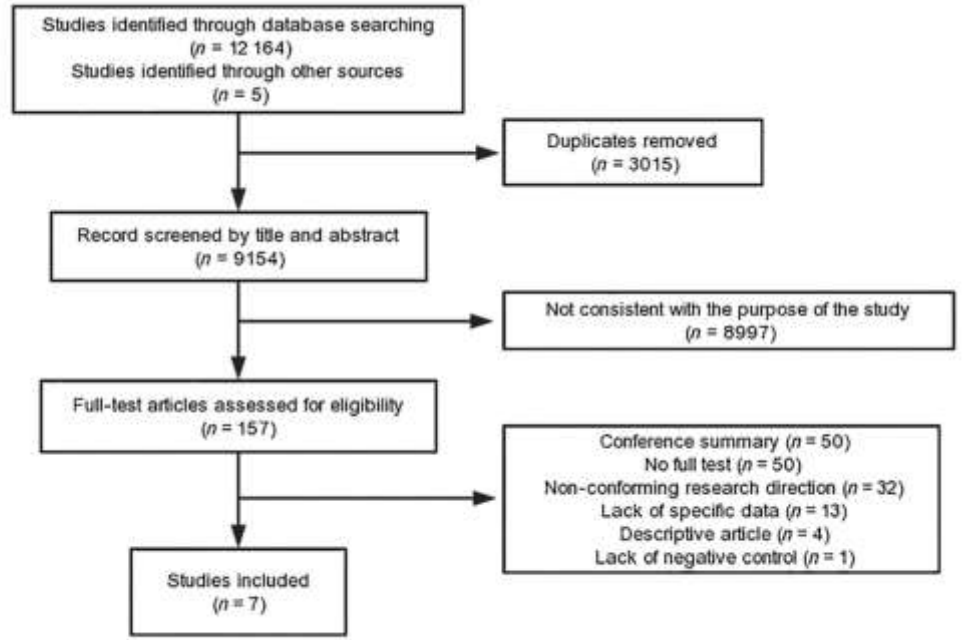

Figure 1 Flow diagram.

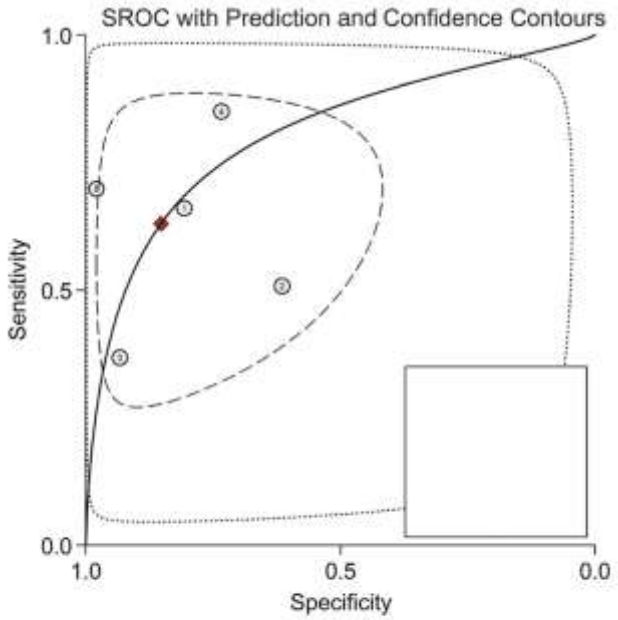

Figure 2 SROC curve for the diagnosis of hiatal hernia about X-ray. ○, Observed Data; ◆, Summary Operating Point: SENS = 0.63 [0.46–0.77]; SPEC = 0.85 [0.69–0.94]; —, SROC Curve: AUC = 0.80 [0.77–0.84]; —, 95% Confidence Contour; ···, 95% Prediction Contour. [Color figure can be viewed at wileyonlinelibrary.com]

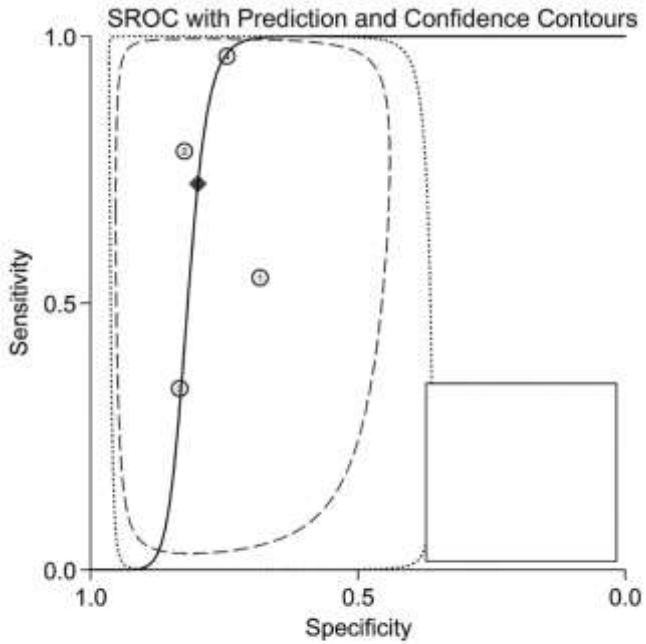

Figure 3 SROC curve for the diagnosis of hiatal hernia about endoscopy. ○, Observed Data; ◆, Summary Operating Point: SENS = 0.72 [0.39–0.91]; SPEC = 0.80 [0.70–0.87]; —, SROC Curve: AUC = 0.82 [0.78–0.85]; —, 95% Confidence Contour; ···, 95% Prediction Contour.

Tukey's multiple comparisons tests were used to compare the AUCs of the three diagnostic methods: No significant differences were found between X-ray and endoscopy (P = 0.7293), and HRM was superior to both X-ray (P = 0.0127) and endoscopy (P = 0.0442).

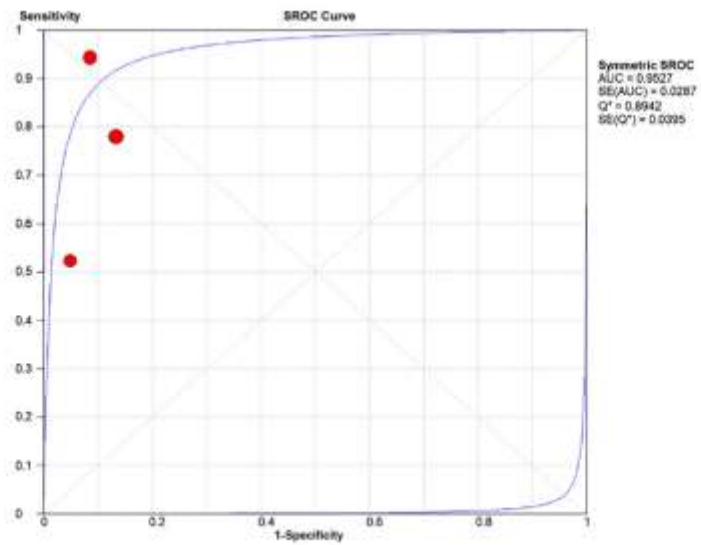

Figure 4 SROC curve for the diagnosis of hiatal hernia about high-resolution manometry. [Color figure can be viewed at wileyonlinelibrary.com]

META ANALYSIS AND SYSTEMATIC REVIEW

Diagnostic value of X-ray, endoscopy, and high-resolution manometry for hiatal hernia: A systematic review and meta-analysis

Lunan Li,*,‡ Huiqin Gao,‡ Chenjing Zhang,* Jiangfeng Tu,* Xiaoge Geng,* Jingya Wang,* Xiaolu Zhou,* Wensheng Pan* and Jiyong Jing†

Journal of Gastroenterology and Hepatology **35** (2020) 13–18

FACTORS THAT REDUCE THE DIAGNOSTIC VALUE

X-RAY

. Limitations of the measurement techniques and X-ray criteria

. Barium esophagogram may induce the shortening of the esophagus and the appearance of physiological hernia, which may lead to difficulty in differentiating with the real HH

UPPER ENDOSCOPY

. The literature's definition of HH is controversial in itself.

. The endoscopic evaluations are influenced by confounding factors such as Barrett's metaplasia,patient's breathing, and air insufflation during the endoscopic examination.

. Diagnosis of HH is largely based on the operator's understanding of human anatomy, pathology, and diagnostic criteria, leading to a subjective bias toward the final result

HRM

. Accurate identification of diaphragmatic and lower esophageal sphincter pressure profiles to identify HH.

. It avoids the influence of the physician's subjectivity.

This approach may significantly improve the diagnostic efficiency

META ANALYSIS AND SYSTEMATIC REVIEW

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Journal of Gastroenterology and Hepatology **35** (2020) 13–18

Comparison of upper gastrointestinal series and symptom questionnaires with intraoperative diagnosis of hiatal hernia during sleeve gastrectomy

Antoine J. Ribieras, M.D., Eli J. Monzon Canales, M.D., Karen Manzur-Pineda, M.D., Melissa Cuesta, L.P.N., Onur Kutlu, M.D., Nestor De La Cruz-Munoz, M.D.*

DeWitt Daughtry Family Department of Surgery, Division of Laparoendoscopic and Bariatric Surgery, University of Miami Miller School of Medicine, Miami, Florida

Surgery for Obesity and Related Diseases ■ (2023) 1–7

Objective: This study compared preoperative and intraoperative hiatal hernia detection rates in patients undergoing laparoscopic sleeve gastrectomy

Methods:

Preoperatevely

. Patients completed the GerdQ and BEDQ

. Routine UGI series

Intraoperatevely

. Anteriorly visible defect-→ HH repair

. All others were randomized to standalone SG or posterior crural inspection

Comparison of upper gastrointestinal series and symptom questionnaires with intraoperative diagnosis of hiatal hernia during sleeve gastrectomy

Surgery for Obesity and Related Diseases ■ (2023) 1–7

Antoine J. Ribieras, M.D., Eli J. Monzon Canales, M.D., Karen Manzur-Pineda, M.D., Melissa Cuesta, L.P.N., Onur Kutlu, M.D., Nestor De La Cruz-Munoz, M.D.*

DeWitt Daughtry Family Department of Surgery, Division of Laparoendoscopic and Bariatric Surgery, University of Miami Miller School of Medicine, Miami, Florida

Table 3
Comparison of hiatal hernia detection rates with preoperative UGI series, GerdQ, and BEDQ compared with intraoperative diagnosis in patients undergoing sleeve gastrectomy (n = 100 patients)

		UGI series		GerdQ ≥8		BEDQ ≥10	
		(+)	(−)	(+)	(−)	(+)	(−)
Conservative approach							
Intraoperative hiatal hernia	(+)	12	22	13	22	1	34
	(−)	14	45	26	39	3	62
Aggressive approach							
Intraoperative hiatal hernia	(+)	16	28	19	26	1	44
	(−)	10	39	20	35	3	52

UGI = upper gastrointestinal series; GerdQ = Gastroesophageal Reflux Disease Questionnaire; BEDQ = Brief Esophageal Dysphagia Questionnaire.

Table 4
Test characteristics of UGI series, GerdQ, and BEDQ for diagnosis of hiatal hernia

Test characteristic, % (95% CI)	UGI series	GerdQ ≥8	BEDQ ≥10
Conservative approach			
Sensitivity	35.3 (19.8–53.5)	37.1 (21.5–55.1)	2.9 (.1–14.9)
Specificity	76.3 (63.4–86.4)	60.0 (47.1–72.0)	95.4 (87.1–99.0)
Positive predictive value	46.2 (31.0–62.0)	33.3 (22.9–45.8)	25.0 (3.5–75.5)
Negative predictive value	67.2 (60.6–73.1)	63.9 (56.2–71.0)	64.6 (62.8–66.4)
Accuracy	61.3 (50.2–71.2)	52.0 (41.8–62.1)	63.0 (52.8–72.4)
Aggressive approach			
Sensitivity	36.4 (22.4–52.2)	42.2 (27.7–57.9)	2.2 (.1–11.8)
Specificity	79.6 (65.6–89.8)	63.6 (49.6–76.2)	94.6 (84.9–98.9)
Positive predictive value	61.5 (44.8–75.9)	48.7 (36.8–60.7)	25.0 (3.5–75.6)
Negative predictive value	58.2 (51.7–64.5)	57.4 (49.4–65.0)	54.2 (52.2–56.1)
Accuracy	59.1 (48.5–69.2)	54.0 (43.7–64.0)	53.0 (42.8–63.1)

UGI series = upper gastrointestinal series; GerdQ = Gastroesophageal Reflux Disease Questionnaire; BEDQ = Brief Esophageal Dysphagia Questionnaire.

Comparison of upper gastrointestinal series and symptom questionnaires with intraoperative diagnosis of hiatal hernia during sleeve gastrectomy

Antoine J. Ribieras, M.D., Eli J. Monzon Canales, M.D., Karen Manzur-Pineda, M.D., Melissa Cuesta, L.P.N., Onur Kutlu, M.D., Nestor De La Cruz-Munoz, M.D.*

DeWitt Daughtry Family Department of Surgery, Division of Laparoendoscopic and Bariatric Surgery, University of Miami Miller School of Medicine, Miami, Florida

Surgery for Obesity and Related Diseases ■ (2023) 1–7

Conclusion

In this prospective study of 100 SG patients, preoperative symptoms and UGI series findings correlated poorly with intraoperative hiatal hernia diagnosis. Whereas high GerdQ and BEDQ scores should prompt further diagnostic evaluation, negative tests do not reliably rule out hiatal hernia. Similarly, in the absence of symptoms, UGI series is unlikely to change management and may increase healthcare resource utilization and inconvenience to patients and delay surgery. Instead, the findings support careful intraoperative inspection of the esophageal hiatus as the optimal method of hiatal hernia diagnosis in SG patients.

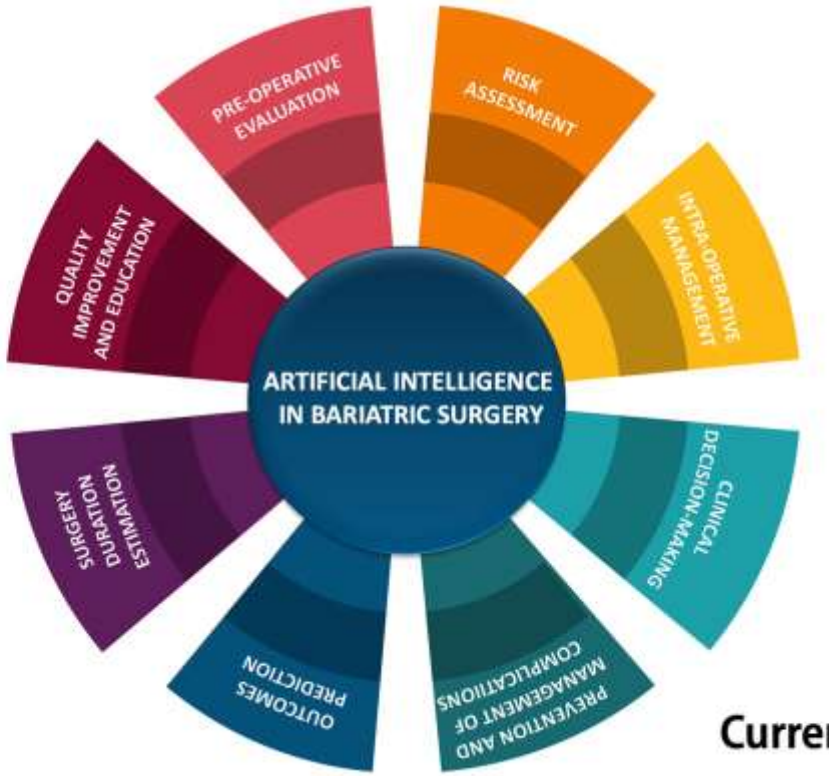

Fig. 4 Role of artificial intelligence (AI) in bariatric surgery. AI can be used in every aspect of the perioperative path, from the presurgical assessment to the intraoperative phase, up to the postoperative management

Fig. 2 Temporal distribution of the articles included in our analysis according to the year of publication

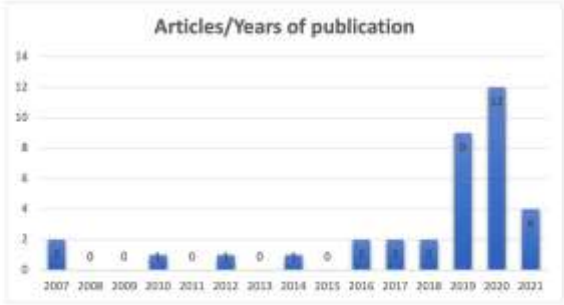

Fig. 3 Pie chart describing the proportion of the studied involved in the review related to the specific phase of the perioperative pathway

Current Applications of Artificial Intelligence in Bariatric Surgery

Valentina Bellini[1] · Marina Valente[2] · Melania Turetti[1] · Paolo Del Rio[2] · Francesco Saturno[1] · Massimo Maffezzoni[1] · Elena Bignami[1]

Obesity Surgery (2022) 32:2717–2733
https://doi.org/10.1007/s11695-022-06100-1

REVIEW

Improving pre-bariatric surgery diagnosis of hiatal hernia using machine learning models

Minimally Invasive Therapy & Allied Technologies

Dan Assaf[a,b], Shlomi Rayman[a,b], Lior Segev[a,b], Yair Neuman[c], Douglas Zippel[a,b] and David Goitein[a,b]

[a]Sackler Faculty of Medicine, Tel Aviv University, Tel Aviv, Israel; [b]Department of Surgery C, Chaim Sheba Medical Center, Tel Hashomer, Israel; [c]The Department of Cognitive and Brain Sciences, Ben-Gurion University of the Negev, Beer Sheva, Israel

Published online: 28 Mar 2021.

Background: Bariatric patients have a high prevalence of hiatal hernia (HH). HH imposes various difficulties in performing laparoscopic bariatric surgery. Preoperative evaluation is generally inaccurate, establishing the need for better preoperative assessment.
Objective: To utilize machine learning ability to improve preoperative diagnosis of HH.

Results: During the study period, 2482 patients underwent bariatric surgery. All underwent pre-operative SS, considered the baseline diagnostic modality, which identified 236 (9.5%) patients with presumed HH. Achieving 38.5% sensitivity and 92.9% specificity. ML models increased sensitivity up to 60.2%, creating three optional models utilizing data and patient selection process for this purpose.

Table 3. Comparison of model efficacy.

Model description	Sensitivity (FN rate)	Specificity (FP rate)	PPV	NPV	Accuracy	MCC
Barium swallow (baseline)	38.5% (115)	92.9% (164)	30.5%	94.9%	88.8%	0.28
Only variables decision tree (without BS)	39.5% (113)	88.4% (267)	21.7%	94.7%	84.7%	0.214
BS + variables decision tree	47.1% (99)	91.5% (194)	31.2%	95.5%	88.2%	0.32
Among females ($N = 1556$)	57.7%	88.3%	32.2%	95.6%	85.6%	0.36
Among positive reflux ($N = 459$)	60.2%	87.5%	45.6%	92.7%	83.4%	0.43

BS: barium swallow; MCC: Matthew correlation coefficient.

Routine preoperative diagnosis of hiatal hernia: is it useful

Impact of routine preoperative HH diagnosis on surgical technique and on financial cost for health care services

Of the 130 surgeons, 69 % specifically look for a hiatal hernia (HH); the remaining 31 % only look for a HH if shown on preoperative studies or if there is a history of gastro-esophageal reflux disease (GERD). If a HH is identified, 89 % (114 surgeons) do a repair, while 11 % do not. For the

> [33] should tend to decrease GERD. The issue is still in dispute, but most surgeons repair a HH (when present) at LSG, and if there is a high degree of GERD and/or a large HH, most would perform a Roux-en-Y gastric bypass [15,

Original article

Fifth International Consensus Conference: current status of sleeve gastrectomy

Michel Gagner, M.D., F.R.C.S.C., F.A.C.S., F.A.S.M.B.S.[a,b], Colleen Hutchinson, M.A.[c], Raul Rosenthal, M.D., F.A.C.S., F.A.S.M.B.S.[c,*]

Preoperative Oesophagogastroduodenoscopy and the Effect on Bariatric Surgery: a Systematic Review and Meta-Analysis

Duncan Muir[1] · Byung Choi[1] · Matthew Holden[2] · Caterina Clements[1] · Jennifer Stevens[1] · Kumaran Ratnasingham[1] · Shashi Irukulla[1] · Samer Humadi[1]

Obesity Surgery (2023) 33:2546–2556
https://doi.org/10.1007/s11695-023-06680-6

Abstract

Preoperative oesophagogastroduodenoscopy (OGD) in bariatric surgery remains a controversial topic, with a large variety in practice globally. An electronic database search of Medline, Embase and PubMed was performed in an aim to categorise the findings of preoperative endoscopies in bariatric patients. A total of 47 studies were included in this meta-analysis resulting in 23,368 patients being assessed. Of patients assessed, 40.8% were found to have no novel findings, 39.7% had novel findings which did not affect surgical planning, 19.8% had findings that affected their surgery and 0.3% were ruled to not be suitable for bariatric surgery. Preoperative OGD is altering surgical planning in one-fifth of patients; however, further comparative studies are required to determine if each patient should undergo this procedure especially if asymptomatic.

47 studies

23,368 patients assessed

40.8% no novel findings

39.7% novel findings that not affect surgical planning

19.8% findings that affect their surgery

0,3%% not be suitable for bariatric surgery

Preoperative Oesophagogastroduodenoscopy and the Effect on Bariatric Surgery: a Systematic Review and Meta-Analysis

Duncan Muir[1] · Byung Choi[1] · Matthew Holden[2] · Caterina Clements[1] · Jennifer Stevens[1] · Kumaran Ratnasingham[1] · Shashi Irukulla[1] · Samer Humadi[1]

Table 1 Potential benefits of OGD. *SG* sleeve gastrectomy

OGD findings	Potential effects
Hiatus hernia	Selection of surgical technique ± additional procedure planning
Oesophagitis/gastritis	Selection of surgical technique – avoidance of SG
Gastro-oesophageal reflux disease	Selection of surgical technique – avoidance of SG
Helicobacter pylori test	Eradication treatment
Gastric polyp	Postponement of surgery/pathology result
Gastric/duodenal ulcers	Selection of surgical technique + medical treatment
Possible malignancy	Cancellation of surgery

Preoperative Oesophagogastroduodenoscopy and the Effect on Bariatric Surgery: a Systematic Review and Meta-Analysis

Obesity Surgery (2023) 33:2546–2556
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Duncan Muir[1] · Byung Choi[1] · Matthew Holden[2] · Caterina Clements[1] · Jennifer Stevens[1] · Kumaran Ratnasingham[1] · Shashi Irukulla[1] · Samer Humadi[1]

ROUTINE PREOPERATIVE DIAGNOSIS OF HIATAL HERNIA: COST-EFFECTIVENESS EVALUATION

Upper endoscopy: estimated cost per patient between £ 3000 and £ 4500

Large financial impact when routinally performed on particular health care services

Patients may be started on medication despite their new findings being completely asymptomatic, and the cost of this can quickly escalate when enough patients are involved.

Furthermore, there is the extra cost of the novel findings that would not alter surgical approach/management

Surg Obes Relat Dis. 2021 January ; 17(1): 72–80. doi:10.1016/j.soard.2020.08.035.

Concurrent hiatal hernia repair and bariatric surgery: outcomes after sleeve gastrectomy and Roux-en-Y gastric bypass

Kristina H. Lewis, M.D., M.P.H., S.M.[a,b,*], Katherine Callaway, M.P.H.[c], Stephanie Argetsinger, M.P.H.[c], Jamie Wallace, M.P.H.[c], David E. Arterburn, M.D., M.P.H.[d], Fang Zhang, Ph.D.[c], Adolfo Fernandez, M.D.[b], Dennis Ross-Degnan, Sc.D.[c], Justin B. Dimick, M.D., M.P.H.[e], J. Frank Wharam, M.B., B.Ch., B.A.O., M.P.H.[c]

Repairing small type I hiatal hernias at the time of RYGB is not necessary to achieve resolution of reflux symptoms

Ashley Khouri[1] · Paige Martinez[2] · Madison Kieffer[1] · Eric Volckmann[2] · Jennwood Chen[2] · Ellen Morrow[2] · Natalie Turner[2] · Anna Ibele[2]

Surgical Endoscopy (2023) 37:4910–4916
https://doi.org/10.1007/s00464-022-09653-5

Impact of concurrent hiatal hernia repair during laparoscopic sleeve gastrectomy on patient-reported gastroesophageal reflux symptoms: a state-wide analysis

Ahmad M. Hider, MPhil[a,*], Aaron J. Bonham, M.Sc.[b], Arthur M. Carlin, M.D., F.A.C.S., F.A.S.M.B.S.[d], Jonathan F. Finks, M.D.[a,c], Amir A. Ghaferi, M.D., M.S.[a,b,c], Oliver A. Varban, M.D.[a,c], Anne P. Ehlers, M.D., M.P.H.[a,b]

Surgery for Obesity and Related Diseases ■ (2022) 1–7

CONCLUSIONS

- **Poor correlation between symptoms, routine instrumental work-up and presence of hiatal hernia.**

- **Despite not altering management in the majority of cases, according to clinical practice guidelines, Upper endoscopy is routinely performed in Europe.**

- **Routine UGI series for diagnosis of hiatal hernia prior to bariatric surgery is not recommended, meanwhile it may be suggested to favor a selective approach**

- **HRM could provide an advantage over the conventional approach but more consensus has yet to be reached for its routine use**

CONCLUSIONS

- **The high costs of routine preoperative diagnosis of hiatal hernia must be considered in a dynamic of cost effectiveness analysis.**

- **Further comparative studies are required to determine if each bariatric patient should undergo a routinely preoperative diagnostic procedure for HH, especially if asymptomatic**

- **Is the conservative careful inspection of the hiatus a reliable alternative for a routine hiatal hernia diagnosis in bariatric surgery?**