

Safety of Laparoscopic Adjustable Gastric Banding

An Evidence Update

*Presented to the Ontario Health Technology
Advisory Committee in September 2009*

November 2009



Medical Advisory Secretariat
Ministry of Health and Long-Term Care

About this Update

This report updates the following evidence-based analysis:

Medical Advisory Secretariat. Bariatric surgery: an evidence-based analysis. Ont Health Technol Assess Series [Internet] 2005 August [cited 2009 09 01]; 5(1). 1-148. Available at: http://www.health.gov.on.ca/english/providers/program/mas/tech/reviews/pdf/rev_baria_010105.pdf

Suggested Citation

This evidence update should be cited as follows:

Medical Advisory Secretariat. Safety of laparoscopic adjustable gastric banding: an evidence update. Ont Health Technol Assess Ser [Internet]. 2010 July [cited YYYY MM DD]; 9(Suppl. 2) 1-13. Available from: http://www.health.gov.on.ca/english/providers/program/mas/tech/reviews/pdf/update_LAGB_20090901.pdf

Permission Requests

All inquiries regarding permission to reproduce any content in the *Ontario Health Technology Assessment Series* should be directed to MASinfo.moh@ontario.ca.

How to Obtain Issues in the Ontario Health Technology Assessment Series

All reports in the *Ontario Health Technology Assessment Series* are freely available in PDF format at the following URL: www.health.gov.on.ca/ohtas. Print copies can be obtained by contacting MASinfo.moh@ontario.ca.

Conflict of Interest Statement

All analyses in the *Ontario Health Technology Assessment Series* are impartial and subject to a systematic evidence-based assessment process. There are no competing interests or conflicts of interest to declare.

Peer Review

All Medical Advisory Secretariat analyses are subject to external expert peer review. Additionally, the public consultation process is also available to individuals wishing to comment on an analysis prior to finalization. For more information, please visit http://www.health.gov.on.ca/english/providers/program/ohtac/public_engage_overview.html.

Contact Information

The Medical Advisory Secretariat
Ministry of Health and Long-Term Care
20 Dundas Street West, 10th floor
Toronto, Ontario
CANADA
M5G 2C2
Email: MASinfo.moh@ontario.ca
Telephone: 416-314-1092
TTY: 1-877-512-4055

ISSN 1915-7398 (Online)
ISBN 978-1-4435-4251-7 (PDF)

About the Medical Advisory Secretariat

The Medical Advisory Secretariat is part of the Ontario Ministry of Health and Long-Term Care. The mandate of the Medical Advisory Secretariat is to provide evidence-based policy advice on the coordinated uptake of health services and new health technologies in Ontario to the Ministry of Health and Long-Term Care and to the healthcare system. The aim is to ensure that residents of Ontario have access to the best available new health technologies that will improve patient outcomes.

The Medical Advisory Secretariat also provides a secretariat function and evidence-based health technology policy analysis for review by the Ontario Health Technology Advisory Committee (OHTAC).

The Medical Advisory Secretariat conducts systematic reviews of scientific evidence and consultations with experts in the health care services community to produce the *Ontario Health Technology Assessment Series*.

About the Ontario Health Technology Assessment Series

To conduct its analyses, the Medical Advisory Secretariat reviews available scientific literature, collaborates with partners across relevant government branches, and consults with clinical and other external experts and manufacturers, and solicits any necessary advice to gather information. The Medical Advisory Secretariat makes every effort to ensure that all relevant research, nationally and internationally, is considered.

The information gathered is the foundation of the evidence to determine if a technology is effective and safe for use in a particular clinical population or setting. Information is collected to understand how a new technology fits within current practice and treatment alternatives. Details of the technology's diffusion into current practice and input from practising medical experts and industry add important information to the review of the provision and delivery of the health technology in Ontario. Information concerning the health benefits; economic and human resources; and ethical, regulatory, social and legal issues relating to the technology assist policy makers to make timely and relevant decisions to optimize patient outcomes.

If you are aware of any current additional evidence to inform an existing evidence-based analysis or evidence update, please contact the Medical Advisory Secretariat: MASinfo.moh@ontario.ca. The public consultation process is also available to individuals wishing to comment on an analysis prior to publication. For more information, please visit http://www.health.gov.on.ca/english/providers/program/ohtac/public_engage_overview.html.

Disclaimer

This evidence update was prepared by the Medical Advisory Secretariat, Ontario Ministry of Health and Long-Term Care, for the Ontario Health Technology Advisory Committee and developed from analysis, interpretation, and comparison of scientific research and/or technology assessments conducted by other organizations. It also incorporates, when available, Ontario data, and information provided by experts and applicants to the Medical Advisory Secretariat to inform the analysis. While every effort has been made to reflect all scientific research available, this document may not fully do so. Additionally, other relevant scientific findings may have been reported since completion of the review. This evidence update is current to the date of the literature review specified. This update may be superseded by an updated publication on the same topic. Please check the Medical Advisory Secretariat Website for a list of all evidence-based analyses, updates, and related documents: <http://www.health.gov.on.ca/ohtas>.

Background and Methodology

A literature search was conducted on June 29, 2009 to update the 2005 evidence-based review by the Medical Advisory Secretariat (MAS)¹ on the use of bariatric surgery for the treatment of morbid obesity (search details described in Appendix). Due to concerns regarding complications following laparoscopic adjustable gastric band (LAGB) insertion, safety was the focus of this Evidence Update.

Inclusion criteria for the literature search consisted of:

1. Comparative studies of LAGB vs. laparoscopic roux en y gastric bypass (LRYGB) with at least 1 year of follow-up in morbidly obese patients.
2. Single arm studies with ≥ 100 morbidly obese patients.
3. Studies that account for and stratify modifications in LAGB device and implantation techniques.

Results of Evidence Review

The updated literature search identified three systematic reviews (see Table 1). (1-3) Detailed results of the most recent systematic review by Tice et al. (1) and an observational study (4) that was published after the literature search cut-off date used by Tice et al. are shown in Tables 2 to 5. Notably, the quality of the majority of the studies included in Tice et al. was very low (see Table 6).

Across the studies, it is important to note that:

- Some studies steered higher risk patients into their LAGB arms instead of the LRYGB arms.
- The duration of follow-up varied across studies
 - Follow-up periods in the LAGB arms were longer than those of the LRYGB arms.
 - LAGB patients were followed-up more frequently.
 - Overall, follow-up was generally poor in terms of length and completeness.
- Complications were defined differently across studies
 - Some studies included emesis/dehydration when determining total complication rates but did not provide a definition for such in terms of severity or frequency;
 - Some studies considered LAGB slippage, erosion, and port problems to be “major” complications, others considered them to be “minor” complications;
 - There was a general lack of systematic reporting on the entire range of potential complications
- Weighing the trade-off between complications can be problematic (e.g., port leak vs. anastomotic leak)
- The studies included in Tice et al. (1) that used the perigastric technique exhibited higher rates of slippage/dilation (36% and 20%) than those that used the pars flaccida technique (1% to 14%; see Tables 3 and 6).
- Some studies switched techniques or carried out device modifications midway, such as:
 - Change in band length to avoid stomal obstruction
 - Access port modifications
 - Fat pad removal to avoid stomal obstruction

¹ http://www.health.gov.on.ca/english/providers/program/mas/tech/ohas/tech_baria_010105.html

Concerning surgical technique, a randomized trial was identified that compared the perigastric (n=101) and pars flaccida (n=101) techniques for LAGB. (5) Patient outcomes were followed for 2 years and those who were treated using pars flaccida exhibited significantly less LAGB slippage than those who had undergone surgery using the perigastric procedure (16% vs. 4%, p=0.004).

Conclusions

- The rates of short-term complications are lower with LAGB than with LRYGB.
- Long-term complication rates (i.e., band slippage and erosion) vary considerably, although studies using updated modifications to the implantation procedure or device show a decrease in the rate of these complications.

Table 1: Results of Systematic Reviews Identified in the Updated Literature Search for LAGB

Study	Overall Safety Results
Tice et al. 2008 (1)	<ul style="list-style-type: none"> ▪ The complication rates of each procedure differed markedly from study to study. This likely reflects different lengths of follow-up and different definitions of significant complications across studies. ▪ It is difficult to weight the tradeoffs between complications. For example, a port leak that requires a minor reoperation is less important than an anastomotic leak that causes peritonitis and sepsis.
Blue Cross Blue Shield Technology Evaluation Center 2008 (2)	<p>Short-Term Complications</p> <ul style="list-style-type: none"> ▪ Very uncommon and occur less frequently with LAGB than with LRYGB <p>Long-Term Complications</p> <ul style="list-style-type: none"> ▪ Higher frequency than short-term complications ▪ Uncertainty due to wide range of reported values ▪ Poor follow-up in terms of length and completeness ▪ Lack of systematic reporting on entire range of potential complications
Canadian Agency for Drugs and Technology in Health 2007 (3)	<ul style="list-style-type: none"> ▪ LAGB may not result in the most weight loss but it may be an option for bariatric patients who prefer, or who are better suited to, less invasive and reversible surgery with lower perioperative complication rates. ▪ One caution with LAGB is the uncertainty about whether the low complication rate extends past 3 years, given the possibility of increased band-related complications that necessitate re-operation (e.g., erosion and slippage).

Table 2: Laparoscopic Adjustable Gastric Banding Short-Term Complication Rates (≤30 days) Reported in Tice et al. (1)

Study	Arm	N	Death (%)	Conversion to Open (%)	Total Short-Term Complications (%)
Weber et al. 2004 (6)	LAGB	103	0	0	18
	LRYGB	103	0	1.0	21
Jan et al. 2005 (7)	LAGB	154	0.6	0.6	3.9
	LRYGB	219	0.5	0.5	5.0
Mognol 2005 (8)	LAGB	179	0.6	0	0.0
	LRYGB	111	0.9	3.6	0.1
Parikh 2005 (9)	LAGB	197	0	0.5	4.7
	LRYGB	97	0	2.1	11
Bowne 2006 (10)	LAGB	60	0	1.7	18
	LRYGB	46	0	0	17
Cottam 2006 (11)	LAGB	181	No separation of short and long term complications.		
	LRYGB	181			
Galvani 2006 (12)	LAGB	470	0	0.2	3.6
	LRYGB	120	0.8	2.5	6.6
Kim 2006 (13)	LAGB	160	0	0	0.6
	LRYGB	232	0	0	5.2
Parikh 2006 (14)	LAGB	480	0	0	3.3
	LRYGB	235	0	0.9	9.4
Rosenthal 2006 (15)	LAGB	152	0	0	4.6
	LRYGB	849	0	0.6	4.4
Angrisani 2007 (16)	LAGB	27	0	0	0
	LRYGB	24	0	4.2	8.3
Jan 2007 (17)	LAGB	406	0.2	0.7	7.9
	LRYGB	492	0.2	0.2	15

Table 3: Laparoscopic Adjustable Gastric Banding Long-Term Complications (>30 days) Reported in Tice et al. (1)

Study	Arm	N	Death (%)	Reoperation (%)	LAGB specific (%)			Total Long-Term Complications (%)	
					Slippage/ dilation (%)	Erosion (%)	Port (%)		
Weber 2004 (6)	LAGB	103	0	26	36	2	1	45	
	LRYGB	103	0	9				14	
Jan 2005 (7)	LAGB	154	0	20	10	1	7	27	
	LRYGB	219	0	14				26	
Mognol 2005 (8)	LAGB	179	0	25	20	1	3	25	
	LRYGB	111	0	10				16	
Parikh 2005 (9)	LAGB	197	Long term complications not reported						
	LRYGB	97							
Bowne 2006 (10)	LAGB	60	0	25	2	0	18	78	
	LRYGB	46	0	7				28	
Cottam 2006 (11)	LAGB	181	0	23	6	0	9	17	
	LRYGB	181	0	19				13	
Galvani 2006 (12)	LAGB	470	0	8	14	0.2	3	17	
	LRYGB	120	0	8				14	
Kim 2006 (13)	LAGB	160	0	0	0	0	4	4	
	LRYGB	232	0	0				0.4	
Parikh 2006 (14)	LAGB	480	0	NR	NR	NR	NR	5	
	LRYGB	235	0.4	NR				NR	
Rosenthal 2006 (15)	LAGB	152	0	14	1	1	0	9	
	LRYGB	849	0	0				9	
Angrisani 2007 (16)	LAGB	27	0	15	8	0	0	8	
	LRYGB	24	0	13				4	
Jan 2007 (17)	LAGB	406	0.2	17	8	1	5	19	
	LRYGB	492	0.6	17				23	

Table 4: LAGB Study Published After Literature Search Cut-off in Tice et al.: Short-Term Complications (≤30 days)

Study	Arm	N	Death (%)	Perforation (%)	Conversion to Open (%)	Total (%)
Te Riele 2008 (4)	LAGB	53	0	0	0	7.5
	LRYGB	53	0	0	0	15.1

Table 5: LAGB Study Published After Literature Search Cut-off in Tice et al.: Long-Term Complications (>30 days)

Study	Arm	N	Death (%)	Reoperation (%)	LAGB specific (%)			Total (%)
					Slippage/Dilation (%)	Erosion (%)	Port (%)	
Te Riele 2008 (4)	LAGB	53	0	3.8	1.9	0	0	3.8
	LRYGB	53	0	18.9				7.5

Table 6: LAGB Technique and Modifications Reported in Studies Included in Tice et al. and Te Riele et al.

Study	LAGB Implant Technique	LAGB Device Modifications Reported During Study	Comment
Weber 2004 (6)	<ul style="list-style-type: none"> ▪ 1995-2003 ▪ Perigastric ▪ 10cm band used ▪ Fat pad removal not reported 	No	<ul style="list-style-type: none"> ▪ Mean follow-up 17.6 ± 8.3 months for LRYGB and 41.9 ± 21.4 months for LAGB ▪ Unclear if consecutive LAGB patients examined.
Jan 2005 (7)	<ul style="list-style-type: none"> ▪ 2000-2003 ▪ Pars flaccida ▪ Fat pad routinely excised 	No	<ul style="list-style-type: none"> ▪ Highest risk patients (older, male, 'super-obese') recommended to undergo LAGB. ▪ Significantly more males and older patients in LAGB group. ▪ "Most of the...band slippage complications occurred early in our learning curve"
Mognol 2005 (8)	<ul style="list-style-type: none"> ▪ 1994-2004 ▪ Perigastric (n=115) ▪ Switched to pars flaccida (n=64) 	10cm then 11cm band used.	<ul style="list-style-type: none"> ▪ All super obese patients (BMI>50 kg/m2). ▪ "Band slippage rate was significantly higher with the perigastric technique than the pars flaccida technique (p<0.001)".
Parikh 2005 (9)	<ul style="list-style-type: none"> ▪ 2000-2004 ▪ Pars flaccida ▪ 10 cm band ▪ After 143 bands, perigastric fat pads routinely removed to avoid stomal obstruction. 	No	<ul style="list-style-type: none"> ▪ All super obese patients (BMI>50 kg/m2).
Bowne 2006 (10)	<ul style="list-style-type: none"> ▪ 2001-2004 ▪ Pars flaccida ▪ Fat pad removal not reported. 	No	<ul style="list-style-type: none"> ▪ All super obese patients (BMI>50 kg/m2).
Cottam 2006 (11)	<ul style="list-style-type: none"> ▪ 2001-2004 ▪ Pars flaccida ▪ 10 cm band ▪ Fat pad removal not reported. 	Redesigned LAGB access port introduced in 2002 by manufacturer.	<ul style="list-style-type: none"> ▪ Significantly more males in LAGB arm. ▪ Authors attribute decline in reoperations following LAGB to redesigned access port, increasing experience securing access port to fascia and ability to eliminate endoscopy except when symptoms suggest erosion or gastroesophageal reflux.

Study	LAGB Implant Technique	LAGB Device Modifications Reported During Study	Comment
Galvani 2006 (12)	<ul style="list-style-type: none"> ▪ 2000-2004 ▪ Pars flaccida ▪ Removal of fat pad started 2004. 	10cm band used, then 11cm used in 2004 (to avoid stomal obstruction)	<ul style="list-style-type: none"> ▪ Included 14-17 year olds half way through study. ▪ Significantly more males in LAGB than LRYGB.
Kim 2006 (13)	<ul style="list-style-type: none"> ▪ 2001-2004 ▪ Started with perigastric then changed to Pars flaccida with fat pad removal and anterior fixation. ▪ 10cm band 	Used redesigned port in 2004	<ul style="list-style-type: none"> ▪ Significantly more males and older patients in LAGB than LRYGB ▪ Bulk food eaters (mostly males) and older high risk patients encouraged to undergo LAGB ▪ LAGB patients followed up more frequently
Parikh 2006 (14)	<ul style="list-style-type: none"> ▪ 2000-2003 ▪ Pars flaccida ▪ After 143 bands, perigastric fat pads were consistently removed ▪ 9.75cm and 10cm bands used 	No	<ul style="list-style-type: none"> ▪ Patients BMI ≥ 35 kg/m² ▪ Patient overlap with Parikh et al. 2005 (which focused specifically on super obese)
Rosenthal 2006 (15)	<ul style="list-style-type: none"> ▪ 2000-2003 ▪ Pars flaccida ▪ Fat pad removal not reported 	No	<ul style="list-style-type: none"> ▪ No comparison of baseline characteristics.
Angrisani 2007 (16)	<ul style="list-style-type: none"> ▪ Jan to Nov 2000 ▪ Pars flaccida ▪ Fat pad removal not reported 	No	<ul style="list-style-type: none"> ▪ --
Jan 2007 (17)	<ul style="list-style-type: none"> ▪ 2000-2005 ▪ Pars flaccida ▪ Fat pad removal not reported 	No	<ul style="list-style-type: none"> ▪ LAGB recommended to highest risk patients (significantly older, male, super obesity)
Te Riele 2008 (4)	<ul style="list-style-type: none"> ▪ 2002-2005 ▪ Pars flaccida ▪ Fat pad removal not reported 	No	<ul style="list-style-type: none"> ▪ Retrospective; matched sex, age and BMI ▪ Unclear if consecutive patients were selected for case control study from database. ▪ Median follow-up 23 months for LAGB and 18 months for RYGB.

Appendix

Final Search – Laparoscopic Adjustable Gastric Banding

Search date: June 29, 2009

Databases searched: OVID MEDLINE, MEDLINE In-Process and Other Non-Indexed Citations, OVID EMBASE, Wiley Cochrane, Centre for Reviews and Dissemination/International Agency for Health Technology Assessment

Database: Ovid MEDLINE(R) <1996 to June Week 3 2009>

Search Strategy:

- 1 exp Gastroplasty/ (2003)
- 2 (lap band* or lapband* or (swedish adj3 band*)).mp. [mp=title, original title, abstract, name of substance word, subject heading word] (262)
- 3 ((intra-gastric or intra-gastric or gastric or adjustable or soft) adj2 band*).mp. [mp=title, original title, abstract, name of substance word, subject heading word] (1396)
- 4 (lagb or sagb).mp. [mp=title, original title, abstract, name of substance word, subject heading word] (381)
- 5 or/1-4 (2448)
- 6 exp Anastomosis, Roux-en-Y/ (1506)
- 7 exp Gastric Bypass/ (2664)
- 8 (gastrojejunostom* or stomach bypass or gastric bypass or gastroileal bypass).mp. [mp=title, original title, abstract, name of substance word, subject heading word] (3553)
- 9 roux en y.mp. (2924)
- 10 or/6-9 (4955)
- 11 10 and 5 (800)
- 12 limit 11 to (english language and humans and yr="2005 - 2009") (369)
- 13 ("200409*" or "200410*" or "200411*" or "200412*").ed. (185582)
- 14 11 and 13 (40)
- 15 12 or 14 (409)
- 16 limit 15 to (case reports or comment or editorial or letter) (37)
- 17 15 not 16 (372)
- 18 from 17 keep 1-372 (372)

Database: EMBASE <1980 to 2009 Week 26>

Search Strategy:

- 1 exp Gastroplasty/ (1644)
- 2 (lap band* or lapband* or (swedish adj2 band*)).mp. [mp=title, abstract, subject headings, heading word, drug trade name, original title, device manufacturer, drug manufacturer name] (204)
- 3 ((intra-gastric or intra-gastric or gastric or adjustable or soft) adj2 band*).mp. (2112)
- 4 (lagb or sagb).mp. (382)
- 5 or/1-4 (3357)
- 6 exp Roux y Anastomosis/ (2856)
- 7 exp Stomach Bypass/ (3164)
- 8 (gastrojejunostom* or stomach bypass or gastric bypass or gastroileal bypass).mp. (5082)
- 9 roux en y.mp. (2958)
- 10 or/6-9 (7294)
- 11 10 and 5 (1085)
- 12 limit 11 to (human and english language and yr="2004 - 2009") (616)
- 13 limit 12 to (editorial or letter or note) (73)
- 14 Case Report/ (1042653)
- 15 12 not (13 or 14) (507)

References

- (1) Tice JA, Karliner L, Walsh J, Petersen AJ, Feldman MD. Gastric banding or bypass? A systematic review comparing the two most popular bariatric procedures. *Am J Med* 2008; 121(10):885-93.
- (2) Technology Evaluation Center. Laparoscopic adjustable gastric banding for morbid obesity [Internet]. Chicago, IL: Blue Cross Blue Shield Association. 2007 Feb. [cited: 2009 Sep 29]. 49 p. Available from: http://www.bcbs.com/blueresources/tec/vols/21/21_13.pdf
- (3) Boudreau R. and Hodgson A. Laparoscopic adjustable gastric banding for weight loss in obese adults: clinical and economic review [Internet]. Ottawa: Canadian Agency for Drugs and Technologies in Health. 2007. [cited: 2009 Sep 29]. 29 p. Technology report number 90. Available from: http://www.acmts.ca/media/pdf/L3009_LAGB_tr_e.pdf
- (4) te Riele WW, Vogten JM, Boerma D, Wiezer MJ, van RB. Comparison of weight loss and morbidity after gastric bypass and gastric banding. A single center European experience. *Obes Surg* 2008; 18(1):11-6.
- (5) O'Brien PE, Dixon JB, Laurie C, Anderson M. A prospective randomized trial of placement of the laparoscopic adjustable gastric band: comparison of the perigastric and pars flaccida pathways. *Obes Surg* 2005; 15:820-6.
- (6) Weber M, Muller MK, Bucher T, Wildi S, Dindo D, Horber F et al. Laparoscopic gastric bypass is superior to laparoscopic gastric banding for treatment of morbid obesity. *Ann Surg* 2004; 240(6):975-83.
- (7) Jan JC, Hong D, Pereira N, Patterson EJ. Laparoscopic adjustable gastric banding versus laparoscopic gastric bypass for morbid obesity: a single-institution comparison study of early results. *J Gastrointest Surg* 2005; 9(1):30-9.
- (8) Mognol P, Chosidow D, Marmuse JP. Laparoscopic gastric bypass versus laparoscopic adjustable gastric banding in the super-obese: a comparative study of 290 patients. *Obes Surg* 2005; 15(1):76-81.
- (9) Parikh MS, Shen R, Weiner M, Siegel N, Ren CJ. Laparoscopic bariatric surgery in super-obese patients (BMI>50) is safe and effective: a review of 332 patients. *Obes Surg* 2005; 15(6):858-63.
- (10) Bowne WB, Julliard K, Castro AE, Shah P, Morgenthal CB, Ferzli GS. Laparoscopic gastric bypass is superior to adjustable gastric band in super morbidly obese patients: A prospective, comparative analysis. *Arch Surg* 2006; 141(7):683-9.
- (11) Cottam DR, Atkinson J, Anderson A, Grace B, Fisher B. A case-controlled matched-pair cohort study of laparoscopic Roux-en-Y gastric bypass and Lap-Band patients in a single US center with three-year follow-up. *Obes Surg* 2006; 16(5):534-40.
- (12) Galvani C, Gorodner M, Moser F, Baptista M, Chretien C, Berger R et al. Laparoscopic adjustable gastric band versus laparoscopic Roux-en-Y gastric bypass: ends justify the means? *Surg Endosc* 2006; 20(6):934-41.
- (13) Kim TH, Daud A, Ude AO, DiGiorgi M, Olivero-Rivera L, Schrope B et al. Early U.S. outcomes of laparoscopic gastric bypass versus laparoscopic adjustable silicone gastric banding for morbid obesity. *Surg Endosc* 2006; 20(2):202-9.
- (14) Parikh MS, Laker S, Weiner M, Hajiseyedjavadi O, Ren CJ. Objective comparison of complications resulting from laparoscopic bariatric procedures. *J Am Coll Surg* 2006; 202(2):252-61.
- (15) Rosenthal RJ, Szomstein S, Kennedy CI, Soto FC, Zundel N. Laparoscopic surgery for morbid obesity: 1,001 consecutive bariatric operations performed at The Bariatric Institute, Cleveland Clinic Florida. *Obes Surg* 2006; 16(2):119-24.
- (16) Angrisani L, Lorenzo M, Borrelli V. Laparoscopic adjustable gastric banding versus Roux-en-Y gastric bypass: 5-year results of a prospective randomized trial. *Surg Obes Relat Dis* 2007; 3(2):127-32.
- (17) Jan JC, Hong D, Bardaro SJ, July LV, Patterson EJ. Comparative study between laparoscopic adjustable gastric banding and laparoscopic gastric bypass: single-institution, 5-year experience in bariatric surgery. *Surg Obes Relat Dis* 2007; 3(1):42-50.