

rue H-Huchard, 75877 Paris cedex 18, France)

Currently, vertical banded gastroplasty (VBG) is the most frequently used gastric restrictive procedure for surgical treatment of severe obesity. The VBG procedure offers good results with minimum morbidity, but has two side effects: risk of staple line disruption (5–6%), and solid food intolerance due to stoma stenosis (15–20%). The adjustable silicone gastric banding (ASGB) is also a gastric restrictive technique and in addition it permits the percutaneous adjustment of the size of the stoma by inflating or deflating the inflatable portion of the band via an injection reservoir placed within the rectus sheath.

From November 1993 to October 1994, ten patients underwent ASGB for severe obesity. There were six females and four males. Mean age was 39 years (range 20–47 years). Preoperative body weight was 135 kg (range 115–176 kg) and body mass index (BMI) was 48.2 kg/m<sup>2</sup> (range 40–59 kg/m<sup>2</sup>). Obesity associated comorbidities included hypertension ( $n = 6$ ), diabetes ( $n = 4$ ), hyperlipidemia ( $n = 4$ ), severe dyspnea ( $n = 9$ ), joint disorder ( $n = 3$ ) and severe psychosocial impairment ( $n = 2$ ). Three patients had conversion ASGB after VBG for total food intolerance.

The mean hospital stay was  $15.5 \pm 2.5$  days. Early postoperative complications included evisceration (one patient), and abscess of the abdominal wall (one patient). No one had a thromboembolism. Apart from adjustments of stoma size percutaneously via the injection reservoir under local anesthesia, no revisional procedures were needed for persistent vomiting or food intolerance. At a mean follow-up of 12 months (range 6–18 months), mean body weight was 96.2 kg (range 75–125 kg;  $P < 0.004$ ), and BMI was 33.5 kg/m<sup>2</sup>;  $P < 0.006$ . Hypertension was corrected in six patients. Dyspnea was resolved in eight patients with a

return of their capacity to perform normal physical activities. There was a complete resolution of diabetes in three patients, and hyperlipidemia in four patients. The follow-up was not long enough to evaluate the effects of the procedure on joint pains and social handicaps.

The total number of patients in this series was too small to draw any definite conclusion; however, the efficacy of ASGB seems to be similar to that of VBG, as far as weight reduction and improvement in the obesity associated comorbidity are concerned. In addition, ASGB has two major advantages: absence of failure from staple line disruption, and a good food tolerance because the stoma size is adjustable to the patient's need. In contrast to VBG, the ASGB procedure is fully reversible after cutting the prosthesis.

**Evolution of energy expenditure during weight loss after vertical banded gastroplasty.** D Honnorat, M Laville, JP Riou (*Service d'endocrinologie, diabétologie, nutrition, CRNHL, hôpital Édouard-Herriot, 69347 Lyon, France*)

During low calorie diets, a decrease in resting metabolic rate (RM) is observed, limiting their mid-term efficiency. Vertical banded gastroplasty (VBG) imposes a prolonged period of caloric restriction and allows a study of RM at the same time as body weight loss. We studied 74 obese subjects (65 women, nine men), aged  $35 \pm 1$  years old, of initial body weight (BW)  $126 \pm 3$  kg and initial body mass index (BMI)  $48 \pm 1$  kg/m<sup>2</sup>, before and up to 24 months after VBG ( $n = 25$ ). RM was measured by indirect calorimetry (Datex Deltatrac) in a fasting state before and 3, 6, 12 and 24 months after VBG. Body weight evolution was as follows:  $108 \pm 3$  kg at 3 months ( $P < 0.001$  vs initial BW),  $97 \pm 4$  kg at 6 months ( $P < 0.001$  vs 3 months),  $87 \pm 3$  kg at 12 months

( $P < 0.001$  vs 6 months), and  $85 \pm 5$  kg at 24 months (NS vs 12 months). The body weight loss was greatest at the beginning of the experimental period:  $21 \pm 1$  kg during the first 3 months, then  $12 \pm 2$  between 3 and 6 months ( $P < 0.001$ ) and  $9 \pm 2$  kg between 6 and 12 months ( $P < 0.001$ ). BW was then stabilized ( $2.6 \pm 2.8$  kg between 12 and 24 months). RM was initially at  $2\,149 \pm 47$  kcal/day and then decreased:  $1\,750 \pm 54$  kcal/day at 3 months ( $P < 0.001$ ),  $1\,726 \pm 56$  kcal/day at 6 months (NS vs 3 months),  $1\,582 \pm 50$  kcal/day at 12 months ( $P < 0.05$  vs 6 m),  $1\,553 \pm 64$  kcal/day at 24 months (NS vs 12 m). RM reduction was massive between 0 and 3 months ( $-20 \pm 1\%$ ), the later changes in RM were smaller ( $-3 \pm 2\%$  between 3 and 6 months,  $-5 \pm 1\%$  between 6 and 12 months,  $1 \pm 2\%$  between 12 and 24 months). RM/BW ratio was initially  $17.1 \pm 0.3$  kcal/day/kg and dropped at 3 months ( $16.5 \pm 0.3$  kcal/day/kg;  $P < 0.002$ ) to increase at 6 months ( $17.7 \pm 0.4$  kcal/day/kg;  $P < 0.05$  vs 3 months), at 12 months ( $18.6 \pm 0.4$  kcal/day/kg;  $P < 0.05$  vs 3 and 6 months), and at 24 months ( $19.1 \pm 0.5$  kcal/day/kg; NS vs 12 m).

We observed in the initial period (0 to 3 months) a massive decrease in RM more than would have been predicted by BW loss. The RM/BW ratio increase was probably linked to a body weight composition modification and a diminution of the fat mass/fat free mass ratio. In conclusion, during VBG we observed a RM stabilization between 3 to 24 months after an initial phase of RM reduction. BW and RM stability after 1 year showed that the calorie level of the diet was probably over  $1\,500$  kcal/day.

**Stabilization of energy expenditure 3 months after vertical banded gastroplasty treatment for morbid obesity.**  
S Normand, M Laville, JP Riou, C Pachiaudi (Centre de recherche en nutrition and Inserm Unité 197, Lyon, France)

Weight loss in response to a vertical banded gastroplasty (VBG) is due to a reduction in calorie intake. This will continue as long as food intake is less than total energy expenditure (TEE). Changes in energy expenditure and food intake are the major determinants of weight loss. Estimation of dietary intake after VBG is very difficult because of vomiting. We studied energy expenditure before and 3 and 6 months after surgery in four morbidly obese patients, aged  $32 \pm 4$  years, weight  $131 \pm 2$  kg, body mass index (BMI)  $49 \pm 2$  kg/m<sup>2</sup> (mean  $\pm$  SEM). Total energy expenditure and body composition (lean mass, fat mass) were determined with doubly labeled water (<sup>2</sup>H<sub>2</sub><sup>18</sup>O). After the oral absorption of <sup>2</sup>H<sub>2</sub><sup>18</sup>O, the evolution of <sup>2</sup>H and <sup>18</sup>O isotopic enrichment of total body water was measured in urine samples at 0 h, 4 h and 14 days with an isotopic ratio mass spectrometer OPTIMA (Fisons). Resting metabolic rate (RMR) was measured by indirect calorimetry (Deltatrac, Datex). Energy expenditure due to physical activity and thermogenesis was calculated: EP = TEE - RMR. Weight loss was maximal during the first 3 months after VBG:  $-21 \pm 4$  kg, then  $-10 \pm 3$  kg between 3 and 6 months. Fat mass loss was large:  $-14 \pm 3$  kg after 3 months and  $-7 \pm 2$  kg between 3 and 6 months. There is a decrease of fat mass when expressed as a percent of body weight from  $52 \pm 4\%$  before, to  $46 \pm 4\%$  6 months after VBG. Lean mass was better preserved:  $-6 \pm 3$  kg at 3 months and  $-2 \pm 1$  kg at 6 months. TEE decreased during the first 3 months from  $3\,227 \pm 187$  to  $2\,557 \pm 110$  kcal/day and was stable between 3 and 6 months at  $2\,642 \pm 72$  kcal/day. RMR followed the same kinetic from  $1\,975 \pm 107$  to  $1\,626 \pm 58$  kcal/day at 3 months and  $1\,659 \pm 72$  kcal/day at 6 months. EP changed little during body weight evolution ( $1\,265 \pm 206$ ,  $931 \pm 167$ ,  $923 \pm 224$  kcal/day) before, 3 and 6 months after VBG respectively.

In summary, 3 months after VBG, we observed a stabilization of TEE and RMR