Experience, outcomes and impact of delayed indication for video-assisted wide septal myectomy in 69 consecutive patients with hypertrophic cardiomyopathy†

Tomás Heredia Cambra*, Lucía Doñate Bertolín, Ana M. Bel Mínguez, Carlos E. Hernández Acuña, Mona Schuler, Manuel Pérez Guillén, Juan A. Margarit Calabuig and José A. Montero Argudo

Department of Cardiovascular Surgery, Hospital Universitari i Politècnic La Fe, Valencia, Spain

* Corresponding author. Hospital Universitari i Politècnic La Fe, Servicio de Cirugía Cardiovascular, Bulevar Sur s/n, CP 46026, Valencia, Spain. Tel: +34-961-246-848; Fax: +34961-246-233; e-mail: tomheca@gmail.com (T. Heredia Cambra).

Received 19 September 2012; received in revised form 18 December 2012; accepted 8 January 2013

Abstract

OBJECTIVES: The aim of this study was to evaluate outcomes in our department after surgery for obstructive hypertrophic cardiomyopathy and to establish the impact of a delay on the indication for surgery.

METHODS: From January 1998 to February 2011, 69 patients with obstructive hypertrophic cardiomyopathy and left ventricular outflow tract obstruction at rest were operated on by the same team, and followed up for at least 1 year. We retrospectively analysed clinical data, echocardiography and ambulatory Holter electrocardiogram findings before surgery, early after surgery, at 3 months and annually at follow-up, to detect possible prognostic determinants.

RESULTS: We performed isolated septal myectomy in 59 patients and a combined procedure in 10 patients. Mean outflow tract gradient decreased by 72.2 mmHg (SD 37.3) and there was a mean reduction in thickness of 8.2 mm (SD 5.8) in the interventricular septum. Functional capacity, measured as New York Heart Association class, and angina of effort improved significantly after surgery (P < 0.0001). In-hospital mortality rate was 1.44% for isolated myectomy and 4.35% for combined procedures. Global actuarial survival at 5-year follow-up was 87.4%, but if those patients who were in functional class II or less at the time of surgery were considered, survival rose to 100%. However, 43 patients (62.3%) with functional class III or higher were operated upon.

CONCLUSIONS: Clinical, haemodynamic and mortality outcomes after surgery were excellent, especially in those patients with mild or few symptoms. However, in our location, surgery is still undertaken at an advanced stage of the natural history of the disease, which may adversely affect prognosis.

Keywords: Hypertrophic cardiomyopathy • Myectomy • Videoassisted

INTRODUCTION

Hypertrophic cardiomyopathy (HCM) is a complex and heterogeneous genetic cardiac disease with a prevalence in the adult general population of about 0.2% (1 in 500) [1]. The natural history of the disease is variable, with most patients remaining asymptomatic or with mild symptoms. With a stable and benign clinical course, less invasive treatments are dictated. However, the clinical course can also be adverse, with increased risk of malignant arrhythmias and sudden death, progressive congestive heart symptoms and other related complications despite optimal pharmacological treatment [2–5]. Left ventricular outflow tract (LVOT) obstruction has been described as an important predictor of morbidity and mortality in patients with HCM [6].

Surgical septal myectomy has shown to be the most effective, immediate and lasting of the approaches in reduction of intraventricular gradient in patients with HCM and LVOT obstruction [2,5,7]. However, the number of patients recruited for such an invasive treatment is small, comprising only those patients with progressive heart failure symptoms, in New York Heart Association (NYHA) functional classes III and IV, refractory to maximal medical therapy, and with the presence of a marked LVOT gradient during resting and/or provocation conditions (peak instantaneous pressure gradient ≥50 mmHg) [2,5].

The aim of this study was to determine, in our patient population, the benefit of surgical treatment (in terms of survival and clinical improvement) when performed before reaching the current criteria for surgical indication established in the 2011 ACCF/AHA Guidelines [5] in comparison to patients operated on in an advanced functional class.
**MATERIALS AND METHODS**

**Study population**

Over a 13-year period (between September 1998 and February 2011), 77 consecutive adult patients underwent video-assisted widened septal myectomy in a single centre. We included in our study 69 cases, with diagnosis of HCM previously established by echocardiographic criteria (septal thickness of at least 13 mm), in the absence of a secondary cause of hypertrophy [5,8,9], and with the presence of a dynamic LVOT peak gradient at rest of ≥50 mmHg, with the condition of being followed up for at least 1 year after surgery. Patients with aortic valve stenosis were excluded.

The timing of the indication for surgery was established based on the presence of symptoms despite optimal pharmacological treatment, concomitant significant mitral regurgitation (MR), or on patients, who consented to surgery due to an unacceptable level of symptoms, despite the level of pharmacological adjustment, after the provision of detailed information regarding the benefits, risks and possible complications of surgery.

**Surgical procedures**

All surgical procedures were performed under cardiopulmonary bypass, with mild hypothermia (30°C), cardioplegic arrest of the heart and left ventricular (LV) venting through the right superior pulmonary vein. We used antegrade and retrograde cold intermittent blood cardioplegia (Cardi-Braun®; B-Braun, Inc., Barcelona, Spain) for myocardial protection. An endoventricular approach was taken through a transverse aortotomy 10–15 mm above the sinotubular junction. After exploration of the aortic valve, we put a 5-0 polypropylene stitch into each Arancio node above the sinotubular junction. After exploration of the aortic valve and the midventricular gradients (Figure 1). If any abnormal chordae insertion existed, this was also corrected. When required, a concomitant procedure was performed.

Intraoperative transoesophageal echocardiography was performed by an expert cardiologist in order to determine the absence of a significant LVOT gradient, residual systolic anterior movement, mitral or aortic regurgitation or an iatrogenic ventricular septal defect. If an MR greater than grade III was observed, another aortic cross-clamping period was started in order to repair or replace the mitral valve.

**Follow-up**

In the first week after surgery, a transthoracic echocardiography study was performed, including measurements of the myocardial wall thickness and cardiac chambers, as in previously published studies [10,11]. In 2002, cardiac magnetic resonance was introduced in our centre, making it possible to include images of late gadolinium enhancement for risk evaluation [12,13] in our protocol.

Postoperative follow-up was carried out by direct interviews with the patient at 3 and 12 months (±1.5 months) after surgery and, thereafter, annually with echocardiographic control.

**Statistics**

We retrospectively analysed data collected in a specially-designed database with FileMaker Pro Advanced© version 11.0 Software (FileMaker, Inc., Santa Clara, CA, USA). Statistical analysis was performed with STATA© statistical package version 10 (StataCorp, College Station, TX, USA).

Continuous data was expressed as means ± SD, while for categorical variables we used percentages and absolute values. Differences between the two groups were compared with the $\chi^2$ test or Fisher's exact test for categorical variables, when necessary; for continuous data we used Student’s paired t-test, or the Mann–Whitney U-test if a normal distribution was not present. To detect intra-individual differences between preoperative and postoperative values in continuous variables, Student’s paired t-test was used, or the Wilcoxon test for non-parametric data. Kolmogorov–Smirnov–Lilliefors test was used to define a normal distribution in continuous data, and Levene’s test for assessing equality of variances. Estimates of long-term survival were made with the Kaplan–Meier method, and differences in survival between the two groups (patients who went to surgery in NYHA class I or II vs those in NYHA class III or IV) were assessed by the log-rank test. A value of $P < 0.05$ was considered statistically significant when comparing differences.

A multivariate model was performed with logistic regression; individual predictors of mortality with a significance level $P \leq 0.10$ were entered step by step into the model. A composite end-point of in-hospital mortality and major postoperative complications (low cardiac output syndrome with requirement for an intraaortic balloon pump or implantation of a circulatory support device, acute renal failure requiring haemodialysis, more than 24 h of mechanical ventilation, reoperation for bleeding, deep wound infection and major neurological injury) was presented to maximize statistical power. The Hosmer–Lemeshow goodness-of-fit test was used to select the best model.

**Ethics**

The Ethical Committee of Hospital Universitari i Politècnic La Fe approved this study, and consent was obtained from all patients.
RESULTS

Baseline characteristics and early results

Extended septal myectomy alone was performed in 59 patients (85.5%). The concomitant surgery required was coronary artery bypass grafting in three cases, procedures on the aortic valve in four (three patients had symptomatic aortic regurgitation concomitant to an HCM, and one patient had a papillary fibroelastoma of the aortic valve), and mitral valve repair or replacement in three. The mean age of the patients was 58 ± 13.7 years (range 19–80 years), and women comprised 56.5% of the study population. Forty-six (66.7%) of the patients displayed an advanced functional class (NYHA class III or IV) before surgery, with a significant difference between genders (79.5% in women vs 50% in men; \(P = 0.01\)), while angina was severe in only 15 of them (21.7%). Preoperative mean thickness of the interventricular septum was 21.8 ± 5.2 mm and resting LVOT dynamic peak gradient was 83.9 ± 27.3 mmHg. The diameter of the left atrium (LA) was 42.9 ± 9.1 mm. Preoperative atrial fibrillation was present in 14 cases (20.1%), corresponding to patients with larger LA diameters (51.1 ± 7.4 vs. 41.6 ± 8.7 mm; \(P = 0.008\)), without any statistical relation to the magnitude of LVOT obstruction or ventricular septal thickness. Previous septal alcohol ablation had been performed in five cases (7.2%), a pacemaker was implanted before surgery in 10 patients (14.5%) and only one (1.4%) had an implantable cardioverter defibrillator (ICD) as primary prevention of sudden death. Other general data are summarized in Table 1.

The mean reduction in thickness registered at 3 months after surgery was 8.2 ± 5.8 mm (\(P < 0.001\)), corresponding to a reduction in intraventricular peak gradient of 72.2 ± 37.3 mmHg (\(P < 0.001\)). The reduction in posterior wall thickness was 1.1 ± 2.9 mm, although we did not resect those segments (\(P = 0.017\)). No significant changes were observed in left ventricular end-diastolic diameter (\(P = 0.847\)), whereas left ventricular end-systolic diameter was increased by 2.1 ± 6.6 mm (\(P = 0.05\)). Further details can be found in Table 2.

Significant MR previous to surgery was present in 27 (39.1%) of the patients (16 cases had a moderate MR and 11 a severe MR), but only five (7.2%) of the patients showed a moderate MR in the early postoperative period.

In-hospital mortality of patients who underwent isolated myectomy was 1.44%, whereas for patients who underwent combined procedures the mortality rose to 4.35%. The only case of death in the isolated myectomy group was due to a haemorrhagic cerebrovascular accident on the 4th postoperative day in a 48-year-old woman. In the combined procedures group, there were three cases of death; the first was a 44-year-old man who required a mechanical mitral valve replacement as a result of valve repair failure at the first attempt, who died as result of early endocarditis; the second was a 41-year-old woman who needed concomitant aortic valve replacement for non-reparable aortic insufficiency, who died 48 h after surgery due to refractory cardiogenic shock; and the last was a 78-year-old man, who underwent concomitant mitral valve repair, developed mediastinitis complicated with multiple organ failure and died 4 months after surgery.

The most frequent early complication was the onset of atrial fibrillation, which occurred in 17 patients (24.6%). Renal insufficiency developed in nine cases (13%), defined as a doubling of the preoperative serum creatinine value or a decrease of >50% in the calculated glomerular filtration rate, and two patients (2.9%) developed severe acute renal failure that required dialysis. In three cases, a permanent pacemaker was implanted because
of postoperative high-grade atrioventricular blockage. Other early postoperative complications are summarized in Table 3.

Chronic renal insufficiency ($P = 0.004$), failure of valve repair with the need for a second period of myocardial ischaemia ($P = 0.001$), and the presence of re-exploration for bleeding, prolonged ventilator support or mediastinitis as a postoperative complication were established as predictors of in-hospital mortality in the univariate analysis. However, for NYHA functional class III or IV, the performance of a concomitant procedure, cardiopulmonary bypass time and aortic cross-clamping time, the level of significance was not reached.

None of these variables had a significant effect in multivariate analysis to be considered as an independent predictor of in-hospital mortality (see Table 4). However, for the composite end-point of in-hospital mortality and/or any major postoperative complication, the performance of a combined procedure adjusted for age, sex and chronic renal failure, was found to be an independent predictor (odds ratio 10.4; 95% confidence interval 2.27–47.56; $P = 0.003$).

### Long-term results

The mean follow-up duration was 26.4 ± 19.2 months (range 1 day to 6.25 years). At 1 year, 93.9% of cases presented NYHA class I or II symptoms ($P < 0.0001$), as well as an improvement of

<table>
<thead>
<tr>
<th>Table 1: Baseline characteristics and surgical procedures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preoperative characteristics</td>
</tr>
<tr>
<td>Demographic and clinical data</td>
</tr>
<tr>
<td>Age</td>
</tr>
<tr>
<td>Sex, female</td>
</tr>
<tr>
<td>Hypertension</td>
</tr>
<tr>
<td>Diabetes mellitus</td>
</tr>
<tr>
<td>Coronary artery disease</td>
</tr>
<tr>
<td>Moderate-severe COPD</td>
</tr>
<tr>
<td>Chronic renal failure</td>
</tr>
<tr>
<td>Dyspnoea</td>
</tr>
<tr>
<td>Chest pain</td>
</tr>
<tr>
<td>Syncpe</td>
</tr>
<tr>
<td>Palpitations</td>
</tr>
<tr>
<td>Prior atrial fibrillation</td>
</tr>
<tr>
<td>Prior septal ablation</td>
</tr>
<tr>
<td>NSVT (preoperative Holter)</td>
</tr>
<tr>
<td>Preoperative pacemaker</td>
</tr>
<tr>
<td>Surgical procedures</td>
</tr>
<tr>
<td>Isolated myectomy</td>
</tr>
<tr>
<td>Concomitant CABG</td>
</tr>
<tr>
<td>Concomitant AVR/repair</td>
</tr>
<tr>
<td>Concomitant MVR/repair</td>
</tr>
<tr>
<td>CPB time (min)</td>
</tr>
<tr>
<td>ACC time (min)</td>
</tr>
</tbody>
</table>

| Values are means (SD) or n (%). $P$ values are derived from univariate analysis to determine whether any difference existed between these two groups (*$P < 0.05$). ACC: aortic cross-clamp; AVR: aortic valve replacement; CABG: coronary artery bypass grafting; COPD: chronic obstructive pulmonary disease; CPB: cardiopulmonary bypass; NSVT: non-sustained ventricular tachycardia; MVR: mitral valve replacement; NYHA: New York Heart Association. |

<table>
<thead>
<tr>
<th>Table 2: Echocardiographic parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preoperative</td>
</tr>
<tr>
<td>Septal thickness (mm)</td>
</tr>
<tr>
<td>Posterior wall thickness (mm)</td>
</tr>
<tr>
<td>LVEDD (mm)</td>
</tr>
<tr>
<td>LVESD (mm)</td>
</tr>
<tr>
<td>LA diameter (mm)</td>
</tr>
<tr>
<td>Resting LVOT gradient (mmHg)</td>
</tr>
<tr>
<td>Moderate-to-severe MR [n (%)]</td>
</tr>
<tr>
<td>Severe PHT [n (%)]</td>
</tr>
<tr>
<td>Ejection fraction (%)</td>
</tr>
</tbody>
</table>

| Values are means (SD). LA: left atrium; LVEDD: left ventricle end-diastolic diameter; LVESD: left ventricle end-systolic diameter; LVOT: left ventricular outflow tract; MR: mitral regurgitation; PHT: pulmonary hypertension. |
the angina (P = 0.001) if compared with preoperative status. The LVOT gradient at rest and the thickness of the interventricular septum remained stable when compared with early postoperative echocardiographic data, whereas posterior wall thickness underwent an additional reduction with respect to the early postoperative period of 1 mm (SD 2.17; P = 0.017). Neither significant changes in ventricular diameters nor significant changes in the cardiac function parameters were observed compared with the early postoperative period.

Moderate MR in the early postoperative period remained stable at the patients’ last echocardiographic assessment during follow-up. Only one case of new asymptomatic severe MR was reported at 1 year follow-up. Two late patient deaths were reported (2.9%), both of which were attributed to cardiac events (congestive heart failure); one of them had previous coronary artery disease. In these two patients, no recurrence of echocardiographic findings was registered in their last echocardiographic assessment. None of the patients suffered any of the following events: sudden cardiac death; ventricular arrhythmias registered in Holter monitoring on follow-up; or new ICD implantation or appropriate defibrillator interventions in those patients with an ICD implanted preoperatively.

For Kaplan–Meier overall postmyectomy survival analysis, we stratified the study population into two groups by functional class: equal to or less than NYHA class II, and equal to or greater than NYHA class III. Compared with the advanced functional class group, the group with lower functional class had better outcomes; the 5-year survival rate was 100% in NYHA classes I and II, and the 1-, 3- and 5-year survival rates in the advanced functional class group were 93.1 ± 1.3, 89.1 ± 2.1 and 83.1 ± 3.7%, respectively. By log-rank test, a trend to a difference between the two groups was shown, but without reaching the level of significance (P = 0.085; Figure 2).

None of the variables analysed was found to be a significant independent predictor for overall mortality on multivariable analysis.

**DISCUSSION**

Since W.P. Cleland performed the first myectomy in the early 1960s [14], more than 50 years of experience endorse the results of the surgical approach for left ventricular outflow tract obstruction in hypertrophic cardiomyopathy [15]. Nevertheless, the classic technique has been improved over recent years, with the development of extracorporeal circulation, myocardial preservation and intraoperative echocardiographic guidance of the procedure [7]. Given the appearance of experienced centres treating large numbers of cases, perioperative mortality has decreased from ≥5% to about 1%, with a very low rate of complications.

---

**Table 3: Morbidity related to myectomy**

<table>
<thead>
<tr>
<th>Complications</th>
<th>NYHA class ≤II (n = 23)</th>
<th>NYHA class ≥III (n = 46)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Second period of ischaemia</td>
<td>–</td>
<td>3 (6.5)</td>
<td>0.004*</td>
</tr>
<tr>
<td>Atrial fibrillation</td>
<td>5 (21.7)</td>
<td>12 (26.1)</td>
<td>0.636</td>
</tr>
<tr>
<td>Reoperation due to bleeding</td>
<td>–</td>
<td>2 (4.3)</td>
<td>0.038*</td>
</tr>
<tr>
<td>Neurological injury</td>
<td>–</td>
<td>1 (2.2)</td>
<td>0.001*</td>
</tr>
<tr>
<td>Acute renal failure (RIFLE classification)</td>
<td>–</td>
<td>–</td>
<td>0.05*</td>
</tr>
<tr>
<td>Renal injury</td>
<td>1 (4.3)</td>
<td>8 (17.4)</td>
<td>0.58</td>
</tr>
<tr>
<td>Renal failure (diabetes)</td>
<td>2 (4.3)</td>
<td>2 (4.3)</td>
<td>0.006*</td>
</tr>
<tr>
<td>Permanent pacemaker</td>
<td>2 (4.3)</td>
<td>2 (4.3)</td>
<td>0.97</td>
</tr>
<tr>
<td>Wound infection</td>
<td>3 (6.5)</td>
<td>3 (6.5)</td>
<td>0.024*</td>
</tr>
<tr>
<td>Prolonged ventilation (&gt;24 h)</td>
<td>–</td>
<td>6 (6.5)</td>
<td>0.001*</td>
</tr>
<tr>
<td>Ventricular septal defect</td>
<td>–</td>
<td>1 (2.2)</td>
<td>0.97</td>
</tr>
</tbody>
</table>

Values are given as n (%). P values are derived from univariate analysis for prediction of in-hospital mortality (*P < 0.05).

**Figure 2:** Kaplan–Meier survival curve for overall mortality. Overall survival was 100% at 5 years in patients with preoperative New York Heart Association (NYHA) functional class I–II (continuous line), vs. 93.1% at 1 year, 89.1% at 3 years and 83.1% at 5 years in patients with NYHA functional class III–IV before surgery (dashed line). Patients at risk are presented in the inset table below the Kaplan–Meier curves.

**Table 4: Predictors for in-hospital mortality**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Univariate odds ratio (95% confidence interval)</th>
<th>P value</th>
<th>Multivariate odds ratio (95% confidence interval)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chronic renal failure</td>
<td>30.5 (3.6–257.2)</td>
<td>0.002</td>
<td>83.6 (0.3–2193.3)</td>
<td>0.53</td>
</tr>
<tr>
<td>Concomitant surgery</td>
<td>4.7 (0.8–26.6)</td>
<td>0.08</td>
<td>0.01 (0.001–192.2)</td>
<td>0.53</td>
</tr>
<tr>
<td>Cardiopulmonary bypass time</td>
<td>1.03 (1–1.1)</td>
<td>0.01</td>
<td>1.07 (0.96–1.19)</td>
<td>0.23</td>
</tr>
<tr>
<td>Aortic cross-clamp time</td>
<td>1.04 (1–1.1)</td>
<td>0.01</td>
<td>1.01 (0.918–1.11)</td>
<td>0.85</td>
</tr>
</tbody>
</table>
4.4), risk of sudden death (relative risk 2.1) and cardiovascular
implications for the clinical progression of the disease (relative
risk 4.4), risk of sudden death (relative risk 2.1) and cardiovascular
causes of death (relative risk 1.6) [6]. They also suggested that, in
selected cases, taking into consideration the implication of the
grade of obstruction for survival, an earlier timing of invasive
treatment (usually surgery) may be warranted; moreover, this may
be warranted if there had been marked obstruction to LV outflow
for a long time, even if no symptoms had developed [6].

Although our study hypothesis was not confirmed, because
there was no significant evidence that earlier surgical treatment
decreased overall mortality, a tendency (P = 0.085) was found if
we compared this group with patients operated on in an
advanced functional class. It is likely that enlarging the sample
size of the study would yield significance. It must be highlighted
that the absence of ventricular arrhythmias on ambulatory
(Holter) ECG recordings, new ICD placements or ICD-sensed and
aborted ventricular tachyarrhythmia in patients with a previously
implanted ICD in our study cohort might confer to a protective
effect of gradient reduction in the origin of these electrophysio-
logical alterations. In some studies, the incidence of life-
threatening ventricular arrhythmias after myectomy was 0.2–0.9%
per year, which was lower than in patients with an untreated ob-
struction [23]. Nevertheless, no definitive evidence is available
in the published data to demonstrate that myectomy is a protective
factor in lowering the risk of ventricular arrhythmias; therefore,
studies specifically designed for this purpose are needed.

LIMITATIONS

This is a retrospective, mainly descriptive, single-centre study, so
there are important limitations in the results and in the validity
of this data set. Firstly, given that there was no medical arm for
comparison in the design of our study, we cannot prove that
early myectomy is better than medical therapy in terms of sur-
vival. However, the objective of this report is to expose an
observed phenomenon in our cohort of patients that, neverthe-
less, would need an extended and specifically design study in a
larger patient cohort for clarification, so as to avoid possible bias
and confusion factors. Given that sample size remains limited,
this cohort is heterogeneous, which reduces the power to detect
significant differences between groups, so we have observed
only non-significant trends in patterns of behaviour in variables.
Perhaps the small sample is also the reason why we have not
found, in our cohort, the left atrium size, the presence of pre-
operative AF or other parameters previously described as being
related to survival. Also, despite the fact that our group is a refer-
centre in our area, it is a centre with a low number of
patients, which may have an adverse influence on our results.
Finally, we have not included in the analysis the cardiac magnet-
ic resonance data, which would have provided further informa-
tion on the changes after myectomy, because missing data could
affect our results.

Therefore, the results here reported are only a modest de-
scription from a single centre with real working conditions,
without the patient selection that centres of expertise could
have, requesting on-going research.

CONCLUSIONS

In conclusion, surgical treatment by means of widened septal
myectomy for hypertrophic cardiomyopathy has been proven
to provide an effective approach for amelioration of outflow
obstruction and symptomatology, for both severe and mild symptoms, with a low risk in specialized centres once the learning curve is overcome. This might be translated into an increase in survival, probably greater in patients with mild or moderate symptoms. Even so, most of the patients are referred as candidates for surgery when severe maximal drug-refractory symptoms have developed or when a surgical indication is established by a concomitant cardiac disease, worsening the results. Nevertheless, additional and specifically designed studies are required to determine whether early surgical treatment has real implications for survival and the risk of developing complications (e.g. disease progression, ventricular arrhythmias, cerebrovascular accidents), because its efficacy for control of symptoms seems to be more clearly established.

Conflict of interest: none declared.

REFERENCES


APPENDIX. CONFERENCE DISCUSSION

Dr C. Simon (Bergamo, Italy): I would like to ask about NYHA functional class II. Looking at the guidelines, we now know that, normally, patients in NYHA functional classes III and IV who are unresponsive to maximal medical treatment will receive a septal myectomy. So do you think that perhaps some studies, some multicentre studies, can be useful to extend the indication also to patients in NYHA functional class II?

My other question is about the septal myectomy. Do you usually tailor it according to the thickness of the interventricular septum of the patients, or do you always perform it the same regardless of the thickness of it? We know that normally hypertrophic cardiomyopathy is related to mitral valve incompetence. Do you perform any manoeuvre on the subvalvular apparatus?

Dr Cambra: Well, our experience is not so extensive as the series from the Mayo Clinic or the Toronto General Hospital who have published around 300 patients in their reports. But we think that patients in advanced NYHA functional class have higher mortalities, as is also seen with other types of surgery. In our study, no deaths at follow-up were related to the less symptomatic patients. Only the presence of functional class II is associated with higher overall mortality at follow-up in the literature. This is one of the end points in the paper from Maron and colleagues; they describe a 10% annual rate of evolution to functional class III or IV only with the onset of symptoms, not limiting symptoms, before the patient develops heart failure symptoms. For these reasons we think that in functional class II, the risk of evolution at one year follow-up is too high.

Referring to the technique, we try to achieve an interventricular septum thickness around 13 mm. Of course, the majority of patients do not need any additional procedure to the mitral valve in spite of the significance of their mitral regurgitation, because we try to extend the myectomy to the apex and liberate the papillary muscles to avoid restriction of the movement of the mitral valve apparatus that is sometimes associated with the hypertrophic cardiomyopathy.

Dr R. Lorusso (Brescia, Italy): I have a question. You mentioned electrocautery. You said that sometimes you use it, if this is correct. Do you always use it to finish your resection? You showed the video at the end of the procedure.

Dr Cambra: We always make a myectomy with a scalpel near the nadir of the noncoronary sinus to avoid the heat injury of the conduction system, while the rest of the myectomy, extended myectomy, is made with an electrocautery hand-held resector. This is the same sort of resector that could be used in a prostatectomy.

Dr Lorusso: Would you elaborate a little bit more on that? I mean, do you have a specific indication or do you use it in all the cases?

Dr Cambra: We use it in all cases.