

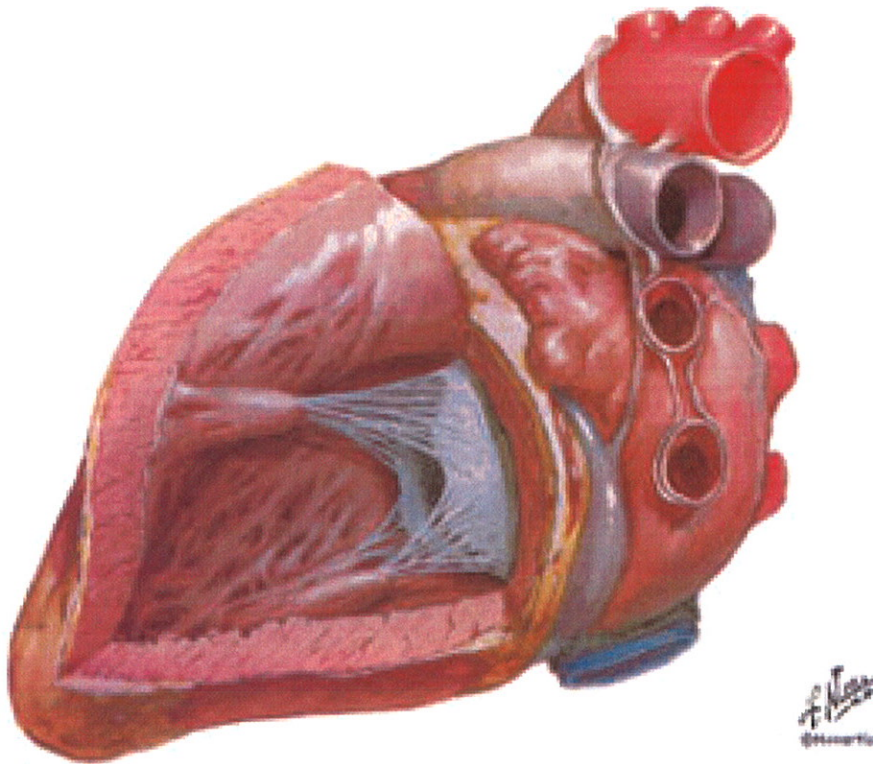
DEMOGRAPHIC ALTERATIONS IN MITRAL VALVE SURGERY

WHO NEEDS SURGERY IN NORWAY IN 2006?

5.årsoppgave i Stadium IV - medisinstudiet ved Universitetet i Tromsø.

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ABSTRACT

Objectives: The results of mitral valve surgery are most often presented by large tertial referral centers with a selected surgical population. We present the development of mitral valve surgery during the last 26 years in a Scandinavian population with special reference to surgical volume, incidence of different mitral valve pathologies and choice of procedures.

Material and methods: All charts from patients referred for mitral valve surgery during the years 1979-2004 (n=296) were reviewed and their preintervention, intervention and postintervention data were assessed. The analysis was done by dividing the patients into 5-year cohorts, and the cohorts were compared for the incidence of rheumatic, degenerative, endocarditis related and ischemic mitral valve disease. Additional cardiac procedures, the preoperative EUROscore ⁽¹⁾ and the number of valve repairs were also analyzed.

Results: The number of procedures has steadily increased from 16 procedures/million inhabitants/year to 32 procedures/million inhabitants/year in the last 5 year period. Mitral valve replacement for rheumatic mitral stenosis is now a rare procedure (14,7 % in the last 5 year period). The increase in surgical volume is due to an increasing number of procedures for ischemic and degenerative mitral insufficiencies (35% and 33% of mitral procedures in the last 5 year period). The incidence of surgical treatment for degenerative mitral valve disease in the last 5 year period was 11/million inhabitants/year. Mitral valve repair was done in 38% of all procedure in the last 5 year period.

Conclusion: Mitral valve surgical epidemiology in Northern Norway is now dominated by procedures for ischemic mitral valve disease. The incidence of degenerative mitral valve disease leading to surgical procedures is very low in Northern Norway. The frequency of repairs and outcome must be viewed from this epidemiological background, and the surgical development must focus on how to assess and treat patients with ischemic heart failure and concomitant mitral valve insufficiencies.

INTRODUCTION

At the introduction of cardiac surgery, mitral valve (MV) procedures were dominated by patients with sequela from rheumatic fever, mainly mitral stenosis. This disease is vanishing from the population born and living in the Scandinavian countries, and rheumatic mitral stenosis is no longer the dominating valve pathology.

On the other hand, many tertiary referral centres for mitral valve surgery have a large group of patients with degenerative mitral valve disease⁽²⁾. In this population of patients, a majority lend themselves to valve repair procedures. However, in the large databases, as for instance the STS database⁽³⁾, the share of repair procedures are less than in these dedicated centres, possibly due to a non-selected patient population with different types of pathology found in the average cardiac centre.

The Norwegian registry of cardiac surgery can document a small but significant increase in the number of mitral valve procedures throughout the last 10 years. However, the total number of mitral valve operations in the whole of Norway with all together 6 cardiac centres, is only around 250 per year indicating an incidence of this surgical procedure of approximately 55 procedures/million inhabitants/year. This is an exceedingly small number compared to for instance coronary bypass surgery (approximately 700 procedures/million inhabitants/year).

The present demographic study was done in order to describe the alterations of mitral valve surgery during the last 26 years in a Norwegian centre as a prelude to an analysis of the present need for such surgery. Specifically, we assessed the incidence of MV procedures distributed on the different diagnostic categories and clarified the need for advanced mitral

valve reconstructions. Lastly, with a background from our patient population, we will speculate on the technical challenges and uncovered treatment needs in this group of cardiac surgical patients.

MATERIALS AND METHODS

Patient material:

The study was evaluated by the Internal Review Board “Helse Nord” finding no objections to its conduct in the described manner. All charts from patients referred for mitral valve surgery during the years 1979-2004 at the University Hospital North Norway were reviewed and their preintervention, intervention end postintervention data were assessed. A total of 296 patients had surgery on the mitral valve during this period. There were 142 men and 153 women. The mean age was 61,3 years ranging from 11 to 82. One journal was missing from the archive and we were not able to locate information of this patient.

Categorization and presentation of procedures:

The analyses were done by dividing the patients into cohorts, 79-84, 85-89, 90-94, 95-99 and 00-04. The cohorts were then compared for the incidence of rheumatic, degenerative, endocarditic and ischemic mitral valve disease according to the classification described in Braunwalds textbook⁽³⁾. The preintervention data assessed were the preoperative risk assessment, EUROscore⁽¹⁾, ejection fraction, coronary artery disease and mitral valve pathology. The mitral valve pathology was classified as mitral stenosis or mitral insufficiency. The insufficiencies were subdivided into predominantly annular dilatation, posterior leaflet prolaps, anterior leaflet prolaps, chordal rupture or complex mitral valve lesions. The patients symptoms were registered. Intervention procedures were categorized as the use of prosthesis (biological, mechanical or ring) and type of mitral valve reconstruction used (quadrangular

resection, chordal repair, Key plasty, commisurotomy or complex repairs). Accompanying interventions on other valves and concomitant CABG were registered.

Data assessment:

All data was processed Excel and analyzed the statistical program SPSS 14.0.

RESULTS

Incidence of mitral valve procedures

The number of mitral valve procedures at our institution has increased steadily from 1979 to 2004 (fig 1). In the first period (1979-1984), 46 procedures were done, giving an average of 7,7 procedures per year and an incidence of mitral valve surgery of approximately 16 procedures/million inhabitants/year. In the last period (2000-2004) 75 procedures were done, giving an average of 15 procedures per year or an incidence of 32 procedures/million inhabitants/year.

The spectrum of diseases leading to mitral valve surgery in North-Norway has changed throughout the study period (fig. 2). In the early years, the dominating disease group was rheumatic mitral valve disease, being almost 2/3 of the complete surgical cohort. This has gradually changed over the last decades and now causes of intervention are more equally divided between the different etiologies. The proportion of rheumatic patients has decreased from 65 % to 16 %, these being for a large part redo procedures (fig. 3) Thirtyfour of the 133 procedures due to rheumatic disease in the whole 26 year period were reoperations. In the last period (2000-2004) 4 procedures or 33% out of all together 12 operations due to rheumatic disease were reoperations. For non-rheumatic procedures, only 7 or 4% out of 167 were reoperations. In the last 5 year period interventions due to mitral insufficiencies from

ischemic heart disease make up the largest group being 35% of all mitral procedures. The group of degenerative mitral valve procedures amount to 33% of the operations.

Patients characteristics

The average age of the mitral valve patients (fig. 4) has increased from 57,3 years (Median 58, minimum 11, maximum 72) in the first period to 64,7 years (median 68, minimum 19, maximum 82) in the last period. The mean EUROscore (fig. 5) has also increased from 5,4 (median 5, minimum 2, maximum 12) in the first period to 7,4 (median 5, minimum 2, maximum 15) in the last period.

The gender has also changed. In the first period 65,2 % of the patients was female. This has gradually decreased and in the last 5 year period only 40,0 % was female.

Forty % of all procedures were mitral valve procedures only, 33 % also had CABG and 15% had concomitant aortic valve procedures. Three % had tricuspid valve repair. Finally, 6 % had CABG and multivalve surgery and 3 % had other combinations of procedures (fig 6).

Mitral valve surgical pathology and procedures

The total number of patients with mitral stenosis was 109 (37%). The percentage of stenosis had dropped dramatically from 60,9 % in the first 5 year period to 14,7 % in the last 5 year period (fig 7). Of the predominant mitral valve insufficiencies (165 or 56 % of the total MV procedures), 41 had dilatation of the annulus, 50 had chordal ruptures, 15 prolapses (12 posterior and 3 anterior) and 59 had complex pathology. Of the valvular redo procedures (all together 21 or 7 %) 11 had paravalvular leakage, 9 degenerated biological valves and 1 other.

The different operative techniques are listed in table 1. Mitral replacement with mechanical valve has been and still is the dominating procedure. As seen from the table 1, mitral valve repair was introduced 10 years ago and has increased from 7% in the first period to 38 % in the last period (fig. 8).

Surgical degenerative mitral valve disease (tab. 2) has an incidence of 11/mill inhabitant/year in the last 5 year period. Of the overall 49 procedures done, 24 had only surgery on the mitral valve. Half of these had had their valve repaired. Of the 28 repairs done, 17 were done with combined ring and quadrangular resection. Seven procedures were ring only and 2 had quadrangular resection only. Of the total of 28 repairs, one was converted to valve replacement preoperatively and 1 valve replacement was done within 30 days. There were no late mitral reoperations.

Discussion

There has been a great change in the population undergoing surgery on the mitral valve in Northern Norway. The incident has increased overall, and the population undergoing mitral valve surgery today has quite different pathologies than earlier Rheumatic patients, once totally dominating in mitral valve patients, are now almost none existent. However, patients with ischemic and degenerative heart disease dominate. In a study, from Minneapolis ⁽²⁾, investigating changes in mitral valve surgery from 1979 to 1999, also found degenerative and ischemic etiology is increasing (33,8% to 52,4% and 7,0% to 12,2%). However, in their community, the rheumatic proportion was constant (17,4% and 17,6%). In Minneapolis more than half of the surgical population had degenerative heart disease, in contrast to the dominating ischemic heart disease in our population. In Minneapolis they also found an increase in number of patients and the shift in gender from a majority of female patients to a

majority of male patients. Presently the patients are older and have poorer health than the average patients 20 years ago. This raises new challenges for surgeons and the intensive care units. The underlying reasons for this change are the antibiotic treatment for streptococcal infections and an increasingly older population. The medical treatment and revascularization of ischemic heart diseases has greatly improved and the number of survivors after acute myocardial infarction. Also surgical methods and the intensive care treatment have improved in this period.

Stenosis is now a rear encounter, and insufficiency dominates. This has made it possible to preserve many more mitral valves than earlier and some evidence exists to support a better short end long time survival after repair^(5, 6). The repair rate at The University Hospital of North-Norway is somewhat lower than reported from many other tertiary referral centres for mitral valve surgery. However, in the large databases, as for instance the STS database⁽³⁾, the share of repair procedures are less than in these dedicated centres, possibly due to a non-selected patient population with different types of pathology than what can be found in the average cardiac centre. The volume of degenerative mitral valve diseases leading to surgery is very small in Northern Norway and in Norway in general. However, as the patients with ischemic mitral valve disease dominate, the challenge in the years to come will be to treat old patients with failing ventricles. Sophisticated repair procedures are important to have, but will not serve the majority of the patients population.

Conclusion: The number of mitral valve procedures is increasing and the mitral valve surgical epidemiology in Northern Norway is now dominated by procedures for ischemic mitral valve disease. The incidence of degenerative mitral valve disease leading to surgical procedures is very low in Northern Norway. The frequency of repairs must be viewed from this

epidemiological background. Mitral valve surgery challenge for the future: Surgical indications and techniques in patients with poor health and bad ventricles.

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	Mechanical	Biological	Ring	Ring + Quadrangular	Ring + Chordal	Key Plasty	Quadrangular Resection	Commisuro- tomi	Complex
1979-1984	33	9	0	0	0	1	0	1	2
1985-1989	36	14	2	0	0	0	1	1	0
1990-1994	34	5	5	0	0	2	2	0	1
1995-1999	41	1	11	9	0	3	3	1	2
2000-2004	44	2	13	11	1	2	0	0	2
Total	188	31	31	20	1	8	6	3	7

Table 1: Type of procedures done in the different year groups.

	Only mitral	+CABG	+AVR	+CABG and multi Valve	+Other	Total
Replacement	12	6	3	0	0	21
Repair	12	5	5	4	2	28
Total	24	11	8	4	2	49

Table2: Surgery on degenerative mitral valve disease and concomitant heart procedures.

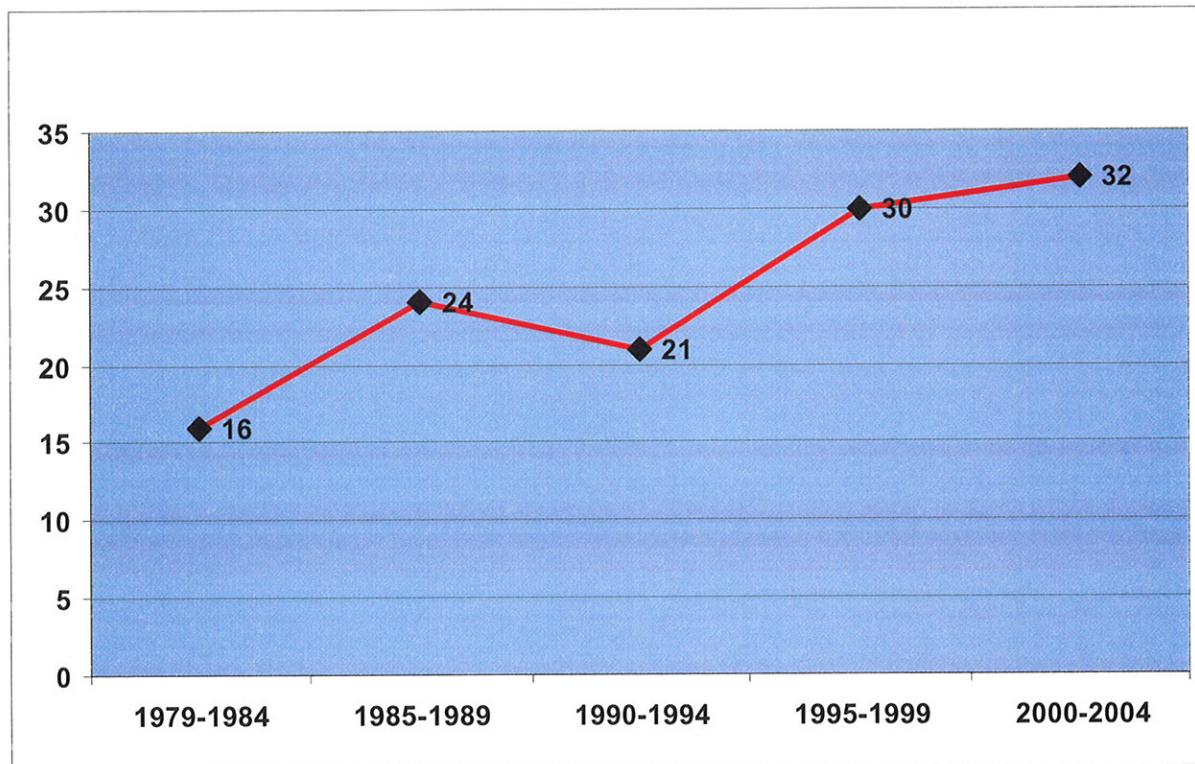


Figure 1: The mean incidents of mitral valve surgery per year in each time period. Shown in numbers per million inhabitants.

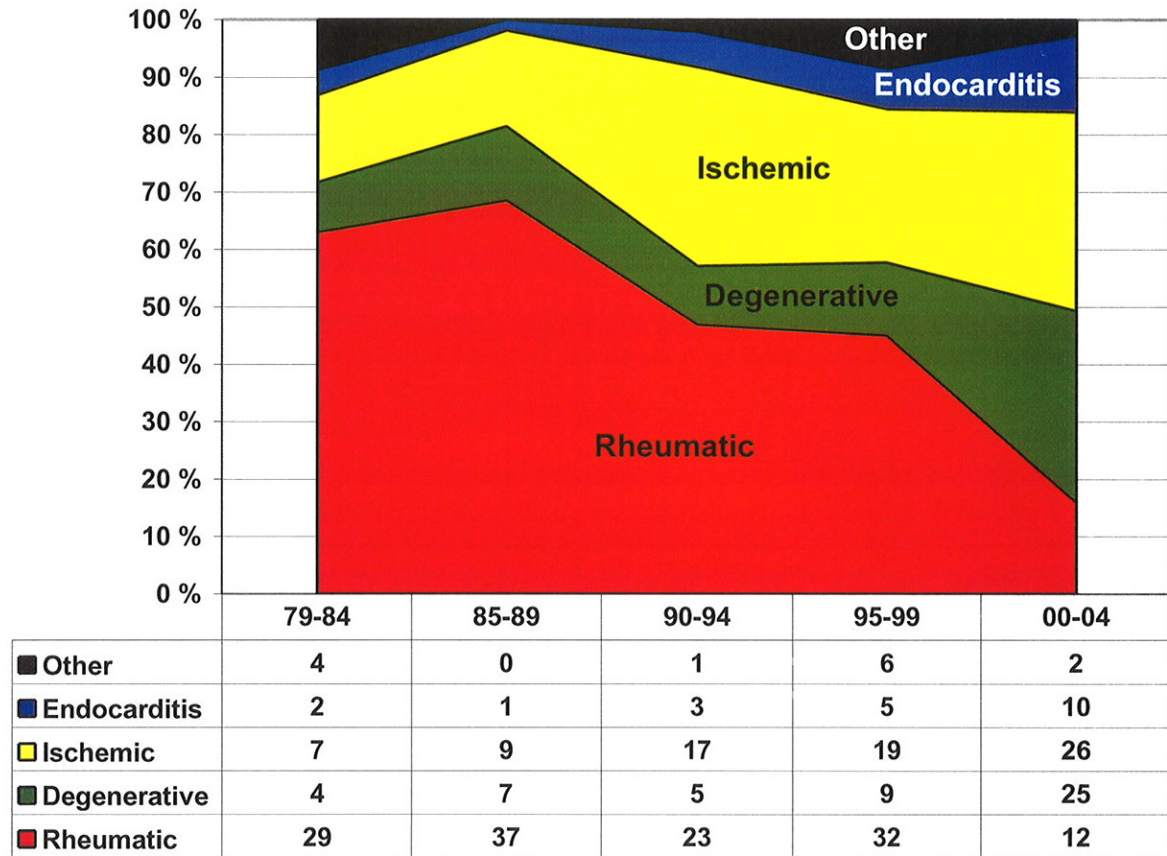


Figure 2: The etiology leading to mitral valve surgery in the different 5 year groups. The graph show the percentage and the table show the absolute number.

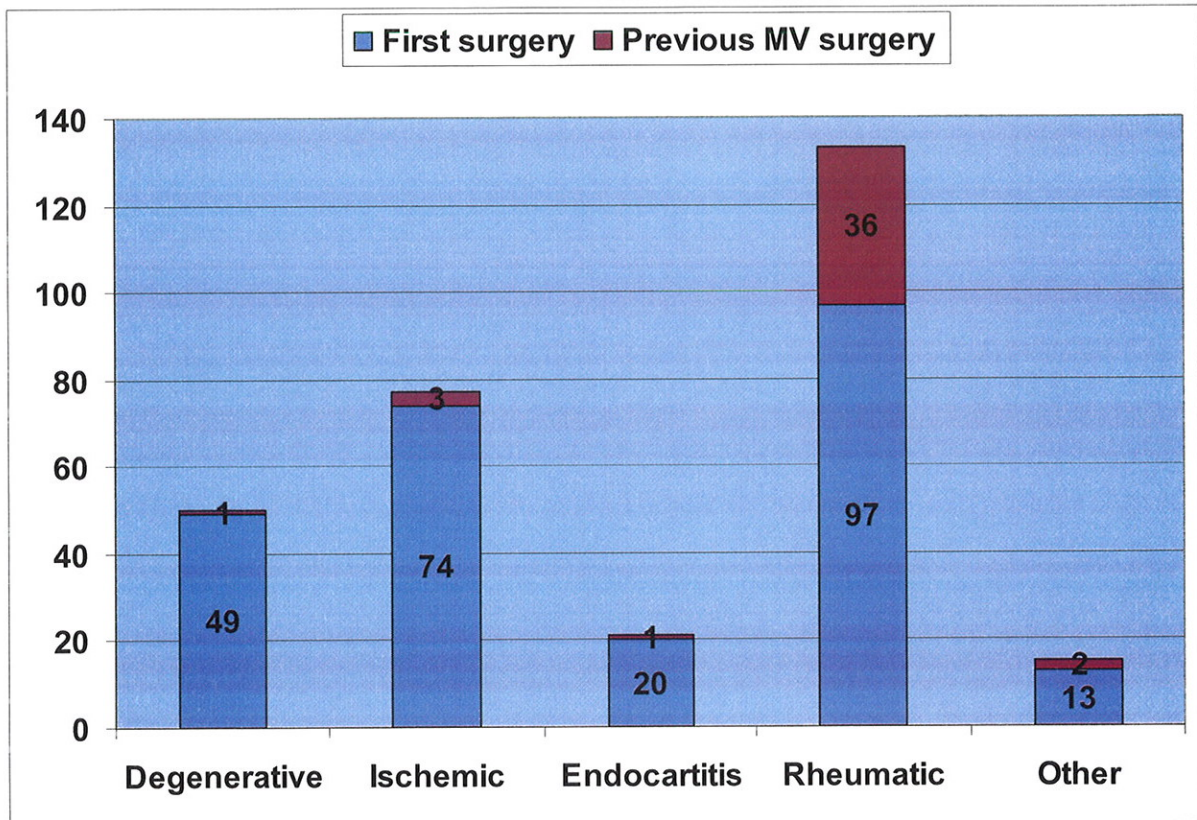


Figure 3: The number of first operation and reoperation on the mitral valve in the different etiology groups.

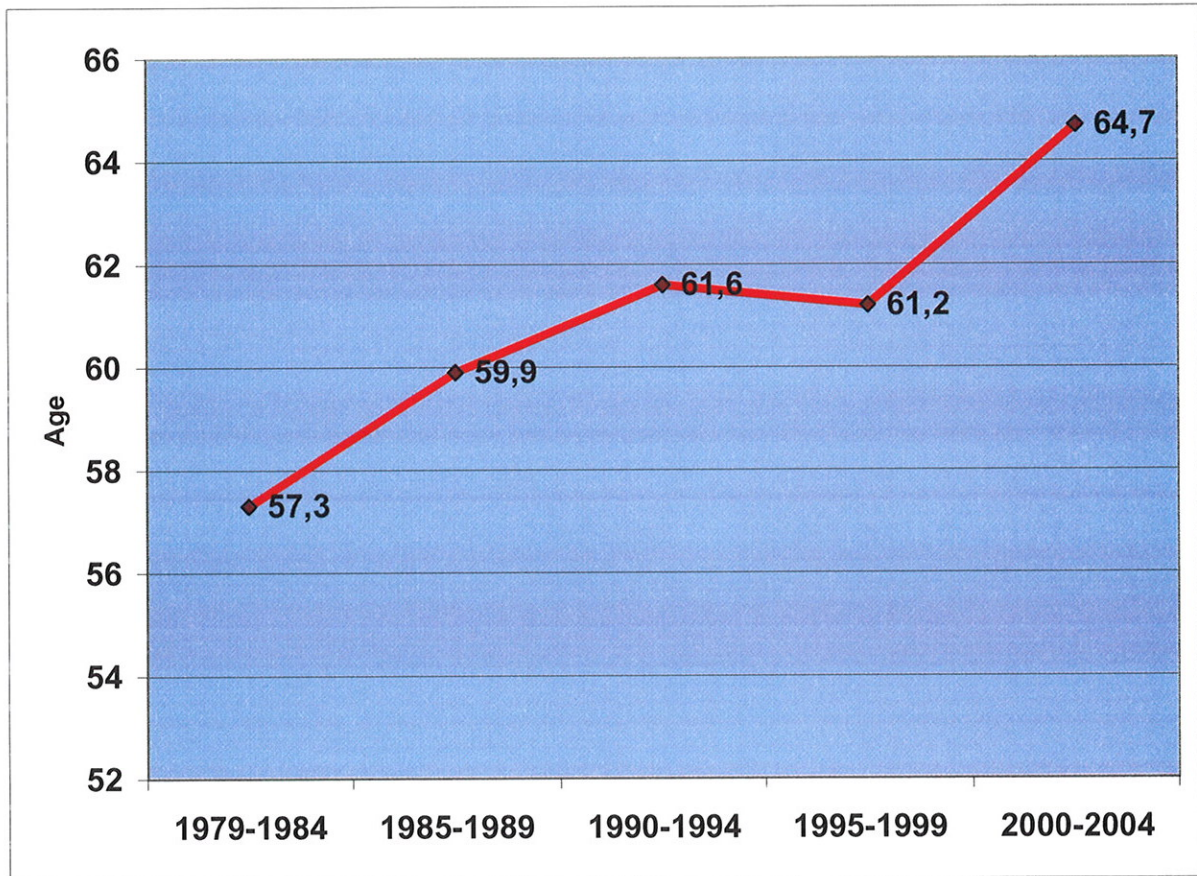


Figure 4: The mean age in the different time periods.

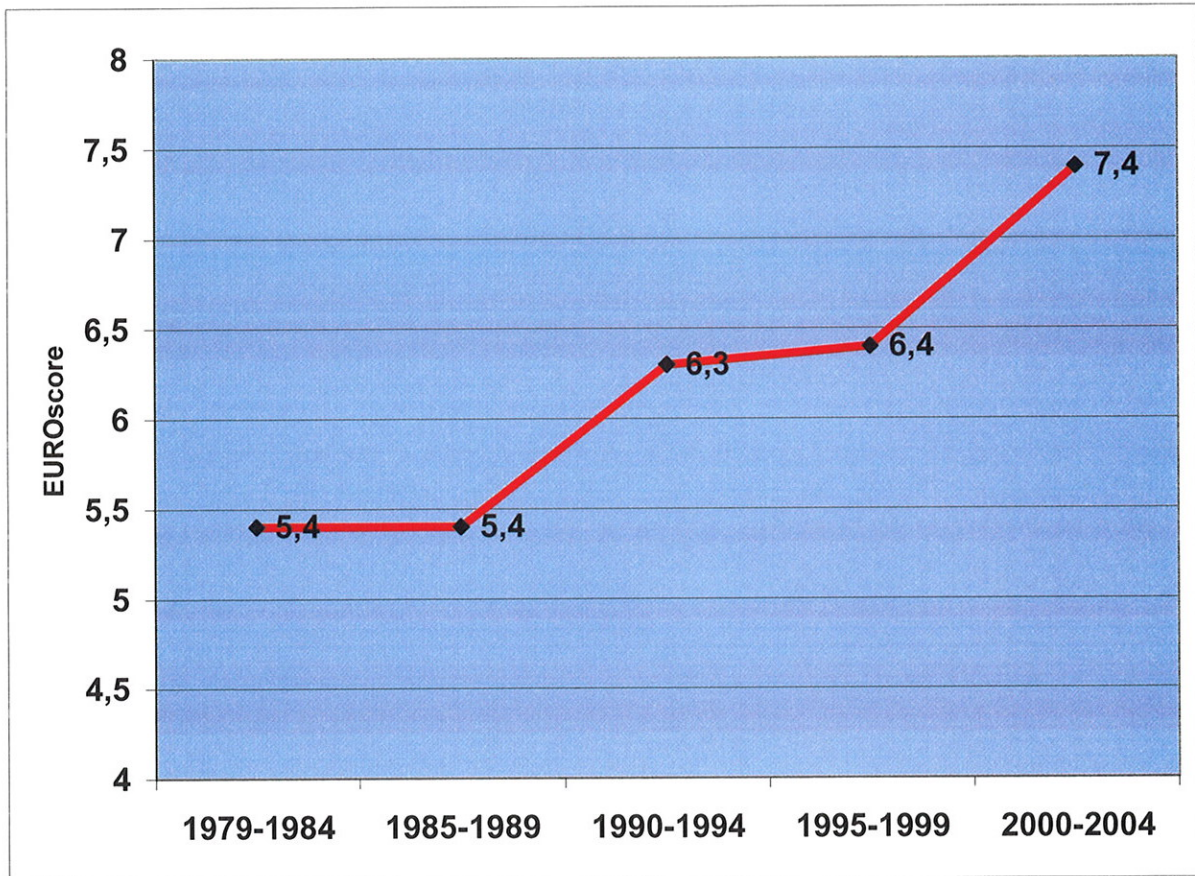


Figure 5: The mean EUROscore in the different time periods.

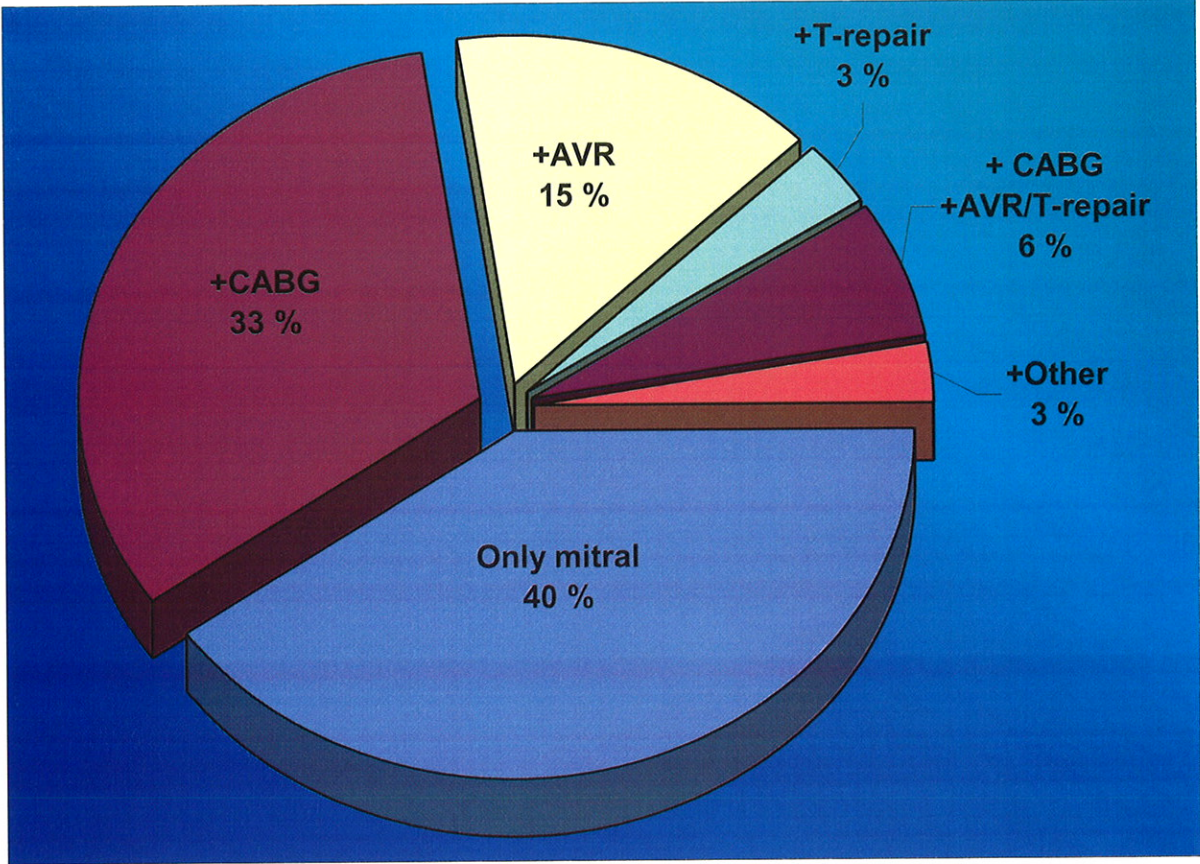


Figure 6: The type of the heart surgery the mitral valve patients had in addition to the mitral valve.

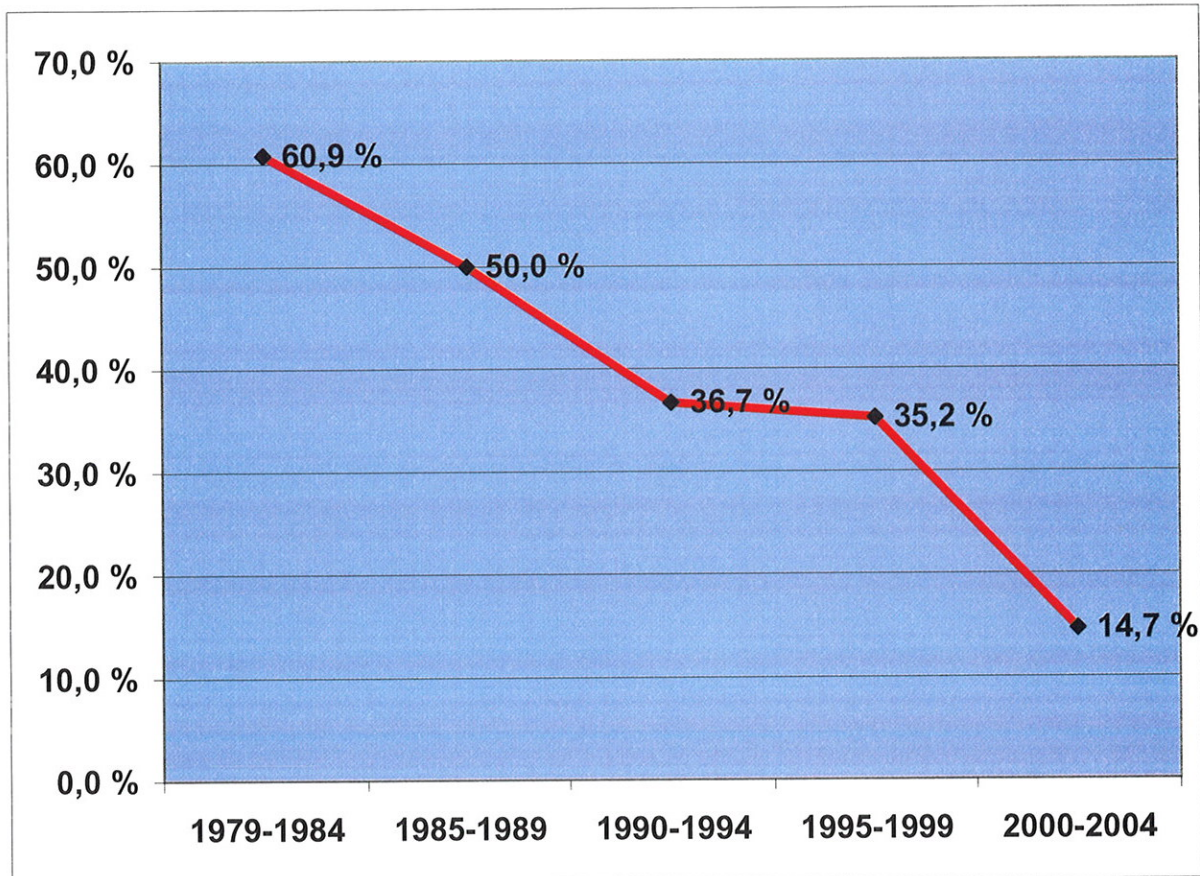


Figure 7: Percentage of patients with mitral valve stenosis in the time periods.

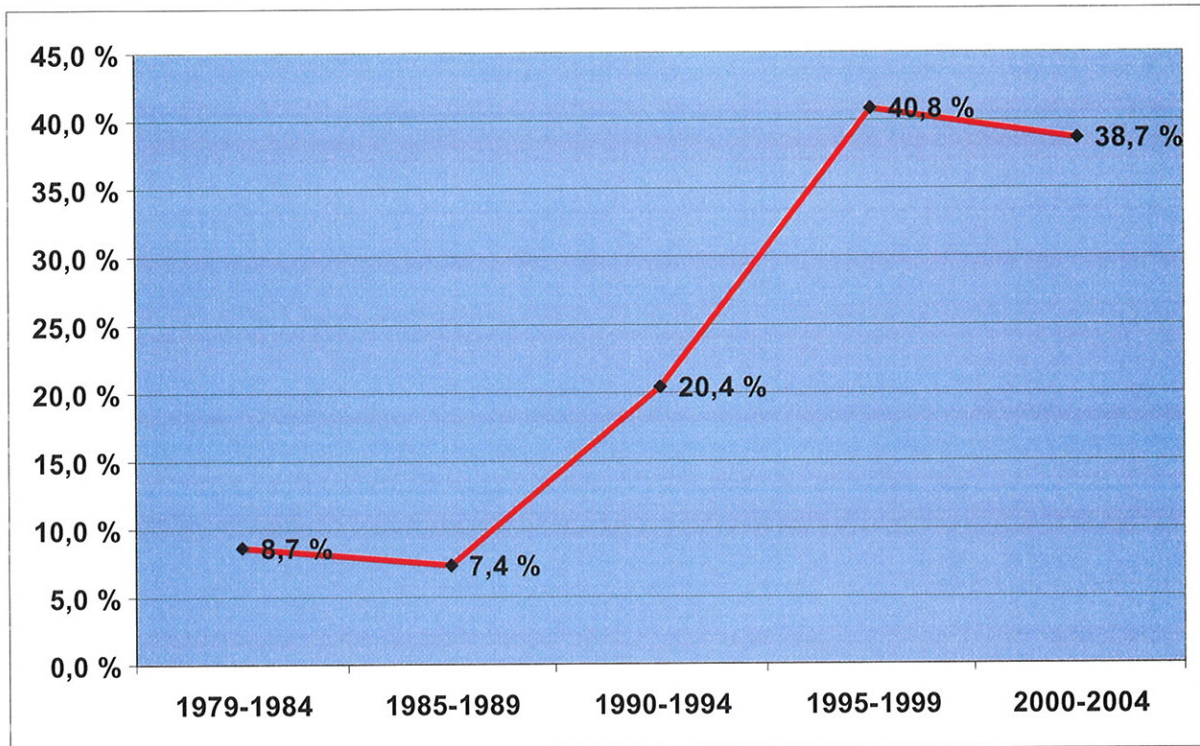


Figure 8: Percentage of mitral valve repair in the different time periods.