

Surgical Management of Pulmonary Disease Due to *Mycobacterium avium-intracellulare*

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Of 131 patients with pulmonary infections due to *Mycobacterium avium-intracellulare*, 124 had excisional surgery plus chemotherapy. Seven had definitive thoracoplasties. Postoperative complications of various degrees developed in 24% of those who had surgery. Bronchopleural fistulae requiring thoracoplasties occurred in seven patients. Nine patients died in the postoperative period. The sputum of 93% of the patients became negative for *M. avium-intracellulare*, and 5% of the patients had bacteriologic relapse. Only two of the 122 patients who survived surgery died from progressive pulmonary infection due to *M. avium-intracellulare*.

Since the early 1950s, surgery has been advocated and successfully used in the treatment of selected cases of atypical pulmonary tuberculosis [1]. Since the earliest cases, we have found the rate of bacteriologic conversion among surgically treated patients at Battey State Hospital (Rome, Ga.) to be excellent [2, 3]. Good surgical results have also been reported by others [4, 5].

Patients

One hundred thirty-one patients with pulmonary disease due to *Mycobacterium avium-intracellulare* underwent surgery at Battey State Hospital during the period 1950–1975. The follow-up period ended in January 1979. For each of these patients at least three isolations of *M. avium-intracellulare* organisms were made before surgery. No patient with a mixed infection was included in this survey.

Ninety of the patients were white men; 15 were black men; 20 were white women; and six were black women. Three of these patients (2.3%) were in their twenties; 20 (15.3%), in their thirties; 54 (41.2%), in their forties; 36 (27.5%), in their fifties; and 18 (13.7%), in their sixties or older. At the time of their first admission, 75 of these patients were classified as having far advanced

disease, 55 as having moderately advanced disease, and one as having minimal disease.

Candidacy for surgery. The relationship between the host and *M. avium-intracellulare* is difficult to prognosticate. In some individuals the organisms are more virulent than is usual, the immunity of the host is less adequate, or both. In many people with this disease, a downhill course leads to a total crippling of respiratory function and to death. However, others may live in seemingly good health for long periods while shedding *M. avium-intracellulare* intermittently or consistently. The difficulty lies in prognosticating which path an individual will follow—a living truce or a steady decline leading to death.

Patients with cavitary disease (especially those whose disease was localized in a lobe) who were shedding organisms after three to six months of chemotherapy were offered excisional therapy if they could tolerate it physiologically and if they did not have other disease that precluded excisional surgery.

Surgical Mortality and Morbidity

In considering the surgical mortality and morbidity of a series of patients during a 25-year span, there is little question that the more recent data are more favorable because of improvements in medical anesthesiology, blood gas studies before, during, and after surgery, and in the precision of pulmonary function studies.

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Hospital, did the gross and microscopic pathologic studies of all freshly resected specimens. All 124 specimens contained cavitation and fibrocaseous disease. Nineteen of the surgical specimens showed endobronchial disease at the margin of resection. Fifty-seven contained evidence of endobronchial disease, but not at the margin of resection.

Twenty-eight patients had reactions of less than one lobe (segment, subsegment, or wedge). Of these 28 patients, three had submucosal endobronchial disease at the margin of resection. Eight (28%) of these patients had complications; four of them (14%), including the three with submucosal endobronchial disease at the margin of resection, required postresection thoracoplasties for problems of residual space. Residual spaces requiring thoracoplasty are generally believed to have underlying bronchopleural fistulae and possible infection. There were no deaths of patients in this group.

Sixty-two patients had lobectomies only. Four (6%) of these patients died; one death was due to cardiac arrest in surgery, one was due to coronary occlusion in the postoperative period, and two were listed as postsurgical deaths due to pulmonary hemorrhage. One patient (1.6%), who had submucosal endobronchitis at the margin of resection, required a postresection thoracoplasty. Nine other patients who had lobectomies had submucosal endobronchitis at the margin of resection but had no complications. Four other patients had nonlethal complications that were resolved with appropriate treatment. Excluding the deaths, complications following surgery developed in five people (8.6%), one of whom required thoracoplasty.

Sixteen patients underwent a lobectomy plus a wedge, subsegment, or segment. Seven had postoperative complications. Four required postresection thoracoplasties to correct continued air leaks with space problems. Two of these patients died. Both had endobronchial disease at the margin of resection. One died from pulmonary insufficiency after thoracoplasty and the other died from nontuberculous pneumonia.

Eight people had two lobes removed (bilobectomies). Two (25%) of these patients developed complications, one (12.5%) required a postresection thoracoplasty to correct a space problem and died of pulmonary insufficiency. Four patients

with submucosal endobronchitis at the margin of resection had no complications.

In one patient, two lobes and a segment were removed. The postoperative space problem did not require a thoracoplasty.

Nine patients had pneumonectomies. One patient (11%) died in the postoperative period from a nontuberculous pneumonitis. The other eight cases were uncomplicated (89%). One patient had submucosal endobronchitis at the margin of resection and had no complication.

Seven patients were treated with definitive thoracoplasties; four had no complications. One patient died postoperatively from a hemorrhage. The complications affecting the other three patients were resolved.

One hundred (76%) of the 131 patients had uneventful postoperative courses. Thirty-one (24%) of the surviving patients had complications. Each death also was counted as a complication. There were nine (6.8%) deaths during or after surgery.

Chemotherapy

The role of chemotherapy in these 131 patients is uncertain. Seven of the patients were treated with isoniazid and *p*-aminosalicylic acid (PAS) only, six during their first hospitalization and one during a second hospitalization at which time surgery was done. Twelve people were treated with streptomycin and PAS, 11 during their first hospitalization and one during a second hospitalization at which time the surgery was done. Twenty-eight people were treated with streptomycin, isoniazid, and PAS, 23 of them during their first hospitalization. Four people were treated with viomycin plus a combination of streptomycin, isoniazid, and PAS; two of these patients had surgery during their first hospitalization. Thirty-three people were treated with combined viomycin and pyrazinamide plus different combinations of streptomycin, isoniazid, and/or PAS; 31 of these patients underwent surgery during their first hospitalization. Three people were treated with isoniazid alone and had surgery during their first hospitalization. Thirty-five patients were treated with combinations of drugs different from those mentioned above. Twenty-two patients underwent surgery during the first hospitalization.

Smears and cultures of sputum from 28 patients

were negative in the month before surgery. For 37 patients, smears were negative and cultures were positive in the month before surgery; five people had positive smears and negative cultures in the month before surgery. Smears and cultures from 55 people were positive in the month before surgery. Sputum specimens from four people were not cultured, but smears from these patients were positive; two people did not have their sputum examined in the month before surgery.

Thirty of these patients underwent surgery during the first month of chemotherapy, 17 during the second month, and 18 during the third month. Thus, 65 patients had early surgery.

Bacteriologic Results

Direct smears and cultures of sputum were negative for 114 patients when they were discharged from the hospital after surgery. For eight patients, smears and cultures were positive in the immediate postoperative period but became negative after the patients were discharged from the hospital. Thus, for 122 (93%) of the patients who underwent surgery, smears and cultures became negative after surgery. With the exclusion of the nine patients who died from causes related to surgery, all patients underwent bacteriologic conversion.

Of the 122 patients whose sputum specimens converted from positive to negative, six (5%) underwent bacteriologic reactivation. Two of these patients with reactivated disease died as a result of progressive pulmonary atypical tuberculosis. The other four intermittently had positive results of sputum tests and are still alive and doing well, living in a truce with their disease. These four people have been observed for 8, 11, 13, and 15 years since their discharge.

Present Status of Patients

At the end of this follow-up (January 1, 1979), 64 of the patients were alive and 67 had died. According to the death certificates, 19 patients died of cardiovascular disorders; 11, from pneumonia; nine, from cancer; four, from emphysema; three, from cor pulmonale; three, from pulmonary hemorrhage; one, from a cerebral hemorrhage; and one, from peritonitis. One death was listed as a suicide; one, as an accidental death from a gun-

shot wound; and one, as the result of chronic alcoholism. Nine deaths were related to surgery. We were unable to determine the cause of death of four patients.

Discussion

One hundred patients (76%) had uneventful postsurgical courses, and 31 patients (24%) had complicated surgical courses. The nine (6.8%) people who died from causes related to surgery are counted among those with complications.

Of the 22 people who survived but had complications, nine (41%) required postresection thoracoplasties. Four of these thoracoplasties were in patients who had small resections (less than a lobe), and three of these four patients had submucosal endobronchitis at the margin of resection. Among 16 patients who underwent lobectomy plus wedge, subsegment, or segment, four developed air leaks and space problems requiring thoracoplasty. All had endobronchial lesions at the margin of resection. Two of them died, one from pulmonary insufficiency and one from a nontuberculous problem. One patient, who had two lobes plus a segment removed, developed a postoperative air leak that was resolved with conservative treatment. One patient in the group that underwent bilobectomy required a thoracoplasty because of residual space problems. Four people in the bilobectomy group had endobronchial disease at the margin of resection. One patient who had two lobes plus a segment removed and had a postexcisional thoracoplasty to reduce the space died of pulmonary insufficiency. Among the patients who underwent pneumonectomy, one had endobronchial disease at the margin of resection that was not related to a complication.

The people who had small resections of less than a lobe or small resections plus a lobectomy were those in whom space problems requiring thoracoplasties were most likely to develop. Accordingly, we favor lobectomy over smaller resections so that the bronchial stump is as far away from the bronchocavitory junction as is possible.

A bacteriologic conversion rate of 100% among the patients who survived surgery and the finding that bacteriologic relapse occurred in only 5% are highly satisfactory results. Only two out of the 122 people who survived surgery had progressive pul-

monary disease, seemingly due to *M. avium-intracellulare* infection, that led to their deaths.

Conclusion

A program of chemotherapy and surgical excision for the treatment of pulmonary infections due to *M. avium-intracellulare* resulted in negative sputums in 93% of the patients. The relapse rate is only 5%, with only two of 122 people documented as having died from progressive disease due to *M. avium-intracellulare* infection after resectional surgery. Lobectomy is the procedure of choice.

References

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