The Decreasing Hazard of Surgical Procedures on Patients with Asthma*

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Asthma is a common and serious disease. As it is often necessary to subject patients with asthma to major or minor surgical procedures, it is important to know how safely such measures can be carried out.

The major purpose of this paper is to contrast the incidence of pulmonary complications observed in two earlier series with the incidence observed in a series of 153 patients with asthma who underwent major surgical procedures at the Mayo Clinic in the period January, 1950, through December, 1955, during an era when effective antibiotics were available. Pulmonary complications encountered in all three groups consisted principally of severe asthma, bronchopneumonia and obstructive pneumonitis. A number of patients in all three groups experienced very mild asthma postoperatively, but these patients were not classified as having pulmonary complications. Only severe status asthmaticus or prolonged asthmatic attacks were included as pulmonary complications.

A secondary purpose of the paper is to report on the incidence of pulmonary complications in an additional 178 patients who underwent minor operations.

Previous Studies

Two studies similar to the present one have been made previously at the clinic. The first,† reported in 1942, included 189 consecutive patients with asthma who underwent major surgical procedures in the period July, 1934, through September, 1940. The second study,‡ reported in 1944, included 142 consecutive patients with asthma who underwent major surgical operations in the period October, 1940, through July, 1943. Both previous papers were published before the widespread use of antibiotics.

In the first series, 25 of the 189 patients (13.2 per cent) had some type of pulmonary complication. Pneumonia developed in 10 patients, severe asthma in nine, bronchitis in three, obstructive pneumonitis in two and pulmonary infarction in one. Four postoperative deaths occurred, giving a mortality rate of 2.1 per cent; two of the deaths were related to pulmonary complications (severe asthma and bronchopneumonia) and were presumably responsible, to a great extent, for the subsequent deaths. Approximately 87 per cent of the patients, therefore, underwent operation without pulmonary complications.

In the second series, the study of which was completed during the early years of sulphonamide therapy, 22 of 142 patients (15 per cent) experienced some pulmonary complication. Bronchopneumonia developed in six, obstructive pneumonitis in six, bronchitis in six and severe asthma in four.

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Two postoperative deaths occurred, giving a mortality rate of 1.4 per cent; both deaths followed pneumonia. Thus, 85 per cent of this group of patients with asthma underwent operation without pulmonary complications.

**Present Study**

*Patients Who Underwent Major Operations.*—Some type of pulmonary complication developed postoperatively in only six (3.9 per cent) of the current series of 153 asthmatic patients who underwent major operations. Two of the six patients had bronchopneumonia, two had obstructive pneumonitis, and two had severe asthma (table). This incidence of 3.9 per cent is significantly less than the incidence of 13.2 per cent and 15 per cent respectively for the previous series.

There were two deaths, giving a mortality rate of 1.3 per cent. Bron-

<table>
<thead>
<tr>
<th>Site or Operation</th>
<th>Total Patients</th>
<th>Obstructive Pneumonitis</th>
<th>Bronchopneumonia</th>
<th>Asthma Total</th>
<th>Deaths</th>
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</thead>
<tbody>
<tr>
<td>Gallbladder</td>
<td>33</td>
<td>1</td>
<td>1</td>
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<td>Stomach and duodenum</td>
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<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Colon</td>
<td>11</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
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<tr>
<td>Hernia</td>
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<td>1</td>
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<td>1</td>
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<td>1</td>
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<td>Thyroid</td>
<td>22</td>
<td></td>
<td></td>
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<tr>
<td>Breast</td>
<td>6</td>
<td></td>
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</tr>
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<td></td>
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<td></td>
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</tr>
<tr>
<td>Miscellaneous</td>
<td>18</td>
<td></td>
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</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>153</strong></td>
<td><strong>2 (1.3%)</strong></td>
<td><strong>2 (1.3%)</strong></td>
<td><strong>6 (3.9%)</strong></td>
<td><strong>2 (1.3%)</strong></td>
</tr>
</tbody>
</table>

**Minor Procedures**

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Total</th>
<th>Obstructive Pneumonitis</th>
<th>Bronchopneumonia</th>
<th>Asthma</th>
<th>Deaths</th>
</tr>
</thead>
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<td>4</td>
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<tr>
<td>Intranasal</td>
<td>50</td>
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<td>Esophagoscopy</td>
<td>4</td>
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</tr>
<tr>
<td>Tonsillectomy and adenoidectomy</td>
<td>4</td>
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<td></td>
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</tr>
<tr>
<td>Extraction of teeth</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Dilatation and curettage</td>
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<td></td>
</tr>
<tr>
<td>Miscellaneous</td>
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<td></td>
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<tr>
<td><strong>TOTAL</strong></td>
<td><strong>178</strong></td>
<td><strong>4 (2.2%)</strong></td>
<td><strong>4 (2.2%)</strong></td>
<td><strong>1 (0.6%)</strong></td>
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</table>
chopneumonia appeared to be the cause of death in a patient 77 years of age who had long-standing chronic asthmatic bronchitis and an emphysematous barrel chest with secondary polycythemia. The patient underwent an exploratory operation because of an obstructing prepyloric lesion (visualized roentgenographically) and a duodenal ulcer that penetrated the pancreas. Posterior gastroenterostomy and pyloroplasty for pyloric hypertrophy were performed.

The other death was attributed to severe asthma which came on postoperatively 4 days before death. This patient, a man 64 years old, had been a heavy smoker for 40 years and had chronic bronchitis and dyspnea on exertion, but gave no history of having had paroxysmal nocturnal asthma preoperatively. His operation consisted of palliative segmental resection for a carcinoma of the sigmoid that had spread to the liver.

*Patients Who Underwent Minor Operations.*—The records of 178 asthmatic patients who underwent minor operations during the period mentioned were also reviewed. Four of 81 patients had severe asthma following bronchoscopy, which was the only minor surgical procedure that was followed by a pulmonary complication; thus, 2.2 per cent of the 178 patients had such a complication. Cardiac arrest following bronchoscopy resulted in one death. The arrest was thought to be secondary to severe bronchospasm. Fifty intranasal operations of various types were accomplished without a single pulmonary complication. The remaining 47 miscellaneous minor surgical procedures were performed without incident.

*Combined Groups.*—In the combined groups, which totalled 331 patients, antibiotics were administered pre-operatively to 69 patients and post-operatively to 112. There were altogether 10 patients who had pulmonary complications, of whom seven patients were classed as having the intrinsic type of asthma and three as a combination of intrinsic and extrinsic asthma. In no instance was asthma due wholly to extrinsic factors. Four patients who had complications received antibiotics preoperatively and six received them postoperatively. Steroids were administered postoperatively in three cases. Seven of those who had complications were women and three were men.

The average age of the 331 patients was 54 years, the oldest being 77 years and the youngest 32. The average duration of asthmatic symptoms was 10 years, the longest being 25 years and the shortest two years.

General anesthetic agents consisted mainly of ether or intravenously administered thiopental (pentothal) sodium. Topical anesthesia was used for all intranasal operations and bronchoscopic procedures. No untoward reactions were attributed to the anesthetic agents.

In the two previous papers the incidence of postoperative pulmonary complications was reported to be significantly increased after operations in the upper part of the abdomen, presumably owing to splinting of the diaphragm and the lower thoracic muscles. This observation also appears to be true of the present series, although the data are meager.

It is not possible to compare mortality rates in the three series, because of the variety of underlying diseases present other than bronchial asthma. It is of interest, however, to note that the mortality rate thought to be attributable to pulmonary complications is approximately the same in the three groups (2.1, 1.4 and 1.3 per cent respectively).
Means of Reducing Surgical Hazards

It would be an obvious error to attribute this favorable drop in the frequency of postoperative pulmonary complications to the use of antibiotics alone. Other factors that have contributed to lowering of such complications include careful selection and preoperative preparation of patients, scheduling of the operation at a time most favorable for anesthesia and surgical treatment, postoperative measures to assure an unobstructed airway, and the use of steroid therapy if indicated.

Thus, patients with acute or subsiding respiratory infections and asthma have been denied operation until the infection has entirely subsided. Asthmatic patients who have required general anesthesia have been hospitalized for at least two nights of observation to determine their ability to lie flat in bed (one pillow) all night without having cough or asthma. Appropriate therapy has been administered as long as necessary in the hospital to attain this important objective before submitting any patient to anesthesia and operation. Preoperative rest, humidification of the room, adequate oral and intravenous hydration, nebulization of antibiotics, alevaire and sympathomimetic medications, and croup tents, face tents and oxygen are among the agents or measures that have been used. Epinephrine or norepinephrine, theophylline preparations intravenously and rectally administered, and antihistamines for sedation have been used commonly as occasion has demanded.

Also much has been accomplished in the instruction of resident and nursing personnel in the prevention of pulmonary complications after operation. The necessity of moving the patient frequently in the immediate postoperative period has been emphasized to all concerned, as well as the importance of limiting sedatives and narcotics to a bare minimum. The necessity for the use of suction or bronchoscopy for the removal of tracheobronchial secretions has been materially lessened by these precautions. The intermittent inhalation of carbon dioxide to promote better inflation of the lungs has been used when indicated. When asthma is complicated by emphysema, serious mechanical problems exist that require particular caution, even to denying any but lifesaving operations.

There can be no question that improved technics in the management of asthma together with a better understanding of the underlying disease have contributed to the prevention of postoperative complications.

SUMMARY

In a series of 153 patients with asthma who underwent major surgical procedures at the Mayo Clinic from January, 1950, through December, 1955, there were six (3.9 per cent) who had pulmonary complications after operation. This percentage is significantly less than the 13.2 per cent and 15 per cent respectively observed in two previously reported series from the clinic prior to the widespread use of antibiotics. The decrease is contributed mainly to the optimal control of asthma before and after operation, to the use of antibiotics when indicated, and to the newer steroid therapy. Thus, 96.1 per cent of these patients underwent major surgical procedures without the development of significant postoperative pulmonary complications. It is concluded that the properly prepared asthmatic patient is a good surgical risk.
Pulmonary complications occurred in four of 178 asthmatic patients (2.2 per cent) who underwent minor operations. All the complications consisted of severe asthma and all were associated with bronchoscopy. There was one death in this category.

The mortality rates for the two previously reported series and for the present series of 153 patients who underwent major operations were approximately the same (2.1, 1.4 and 1.3 per cent respectively). It is impossible, however, to compare these rates statistically because of the variety of diseases present other than bronchial asthma.

The majority of complications occurred in those patients with intrinsic asthma of long duration.

No untoward effects were attributed to the anesthetic agents used.

RESUMEN

En una serie de 153 enfermos de asma que se sujetaron a cirugía mayor en la Clínica Mayo de Enero de 1950 hasta Dic. de 1955, hubo 6 (3.9 por ciento) que tuvieron complicaciones pulmonares después de la operación. Este porcentaje es significativamente menor que el 13.2 por ciento y el 15 por ciento respectivamente, referidos en dos series anteriores observadas en la Clínica antes del advenimiento de los antibióticos. El decremento se atribuye principalmente al óptimo control del asma de la operación, al uso de los antibióticos cuando están indicados y a la nueva terapéutica por los esteroides. Así, 96.1 por ciento de estos enfermos pasaron por operaciones mayores sin que se desarrollaran complicaciones pulmonares de importancia. De ahí se concluye que el asmático debidamente preparado es un buen riesgo operatorio.

Ocurrieron complicaciones pulmonares en cuatro de 178 asmáticos (2.2 por ciento) en operaciones menores. Todas las complicaciones consistieron en asma severa y todas estaban asociadas con la broncoscopia. En este grupo hubo una muerte.

La mortalidad para las dos series antes referidas y para las actuales, de 153 enfermos que sufrieron cirugía mayor, fue aproximadamente la misma (2.1, 1.4 y 1.3 respectivamente). Sin embargo, es imposible comparar estas cifras estadísticamente a causa de la variedad de enfermedades, aparte del asma, que presentaban.

La mayoría de las complicaciones ocurrieron en enfermos con asma intrínseca de larga duración.

No se atribuyeron efectos nocivos a los anestésicos usados.

RESUME

Dans un groupe de 153 malades, atteints d’asthme, qui subirent des interventions chirurgicales importantes à la Clinique Mayo, de Janvier 1950 à Décembre 1955, six (3,9%) ont présenté des complications pulmonaires post-opératoires. Ce pourcentage est infiniment moindre que celui de 13,2% et de 15% respectivement observés dans deux groupes rapportés antérieurement, alors que l’emploi des antibiotiques n’était pas encore étendu. La décroissance est attribuée principalement au fait que l’on peut mieux lutter contre l’asthme avant et après l’opération, à l’emploi des antibiotiques lorsqu’ils sont indiqués, et à la très récente corticothérapie. Ce sont les raisons qui ont permis à 96,1% de ces malades de subir des inter-
Surgical Procedures in Asthma

Surgical procedures important without complications pulmonaires post-opératoires importantes. L’auteur en conclut que l’asthmatique convenablement préparé ne court pas de risques chirurgicaux particuliers.

Des complications pulmonaires survinrent chez quatre asthmatiques sur 178 (2,2%) qui subirent des interventions chirurgicales mineures. Toutes les complications consistèrent en asthme sévère et toutes firent suite à une bronchoscopie. Il y eut une mort dans cette catégorie.

Les taux de mortalité pour les deux groupes antérieurement rapportés et pour le présent groupe de 153 malades qui subirent de grandes interventions, furent approximativement les mêmes (2,1; 1,4 et 1,3 respectivement). Il est impossible cependant, de comparer statistiquement ces taux à cause de la variété des affections traitées chez les asthmatiques.

La majorité des complications survinrent chez les malades atteints d’asthme durant depuis longtemps.

On ne peut attribuer un rôle dans les complications aux agents anesthésiques qui furent utilisés.

ZUSAMMENFASSUNG


Pulmonale Komplikationen traten bei 4 von 178 asthmatischen Kranken auf (2,2%), bei denen kleinere Operationen vorgenommen wurden. Diese Komplikationen bestanden sämtlich in schwerem Asthma und alle kamen vor bei Bronchoskopien. In dieser Kategorie trat auch 1 Todesfall ein.

Die Mortalitätsziffern der beiden zuvor mitgeteilten Serien und für die gegenwärtige Serie von 153 Kranken, bei denen größere Operationen vorgenommen wurden, waren ungefähr die gleichen (2,1%; 1,4% bzw. 1,3%). Es ist jedoch unmöglich, diese Werte statistisch zu vergleichen im Hinblick auf die Vielzahl von Erkrankungen, die abgesehen vom Bronchialasthma noch vorlagen.

Die Mehrzahl der Komplikationen trat bei Kranken mit echtem Asthma von langer Dauer ein.

Den angewandten Anaesthetics zuzuschreibende ungünstige Nebenwirkungen wurden nicht beobachtet.

REFERENCES
