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Research Article

Role of fibreoptic bronchoscopy in haemoptysis: an analysis of 157 patients

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ABSTRACT

Background: Objectives of this study were to define the role of fibreoptic bronchoscopy (FOB) in determining the etiology of haemoptysis, to determine whether bronchoscopy is useful in haemoptysis with normal chest x-ray, to determine whether early bronchoscopy is better than delayed bronchoscopy.
Methods: This prospective study was conducted on 157 patients who presented with hemoptysis to the Department of Tuberculosis and Chest diseases. All these patients underwent FOB after taking proper history and examination and ruling out any contraindication to the procedure.
Results: In patients with haemoptysis with normal CXR, a diagnosis was established in 54.5% by FOB while 38.6% had a normal bronchoscopy. An endoscopic diagnosis of bronchitis was made in 22.7% patients. In only 9.1% patients an endobronchial mass was seen on bronchoscopy, and all of them were more than 40 years of age. Active bleeding/bleeding site was localized in 18.1% patients. In patients with abnormal chest roentgenogram who underwent FOB, a definitive diagnosis was established in 75.4% cases with active bleeding/ bleeding site localized in 59.6%. Thirty five percent were having an endobronchial mass. Of all the patients who underwent FOB for recurrent haemoptysis, active bleeding/bleeding site was localized in 48.4% patients. Bleeding site was localized in 62.9% patients who underwent early FOB, while the yield was lower (29.4%) in patients who underwent delayed FOB.
Conclusions: Fibreoptic bronchoscopy (FOB) is an important and useful investigation in patients of haemoptysis in determining the bleeding site and etiology of haemoptysis. Early FOB has higher yield in localizing the bleeding site than delayed FOB.

Keywords: Fibreoptic bronchoscopy, Haemoptysis, Endobronchial mass

INTRODUCTION

Hemoptysis is the coughing up of blood from a source below the glottis.[1] The material that is produced varies from blood tinged sputum to virtually pure blood. It is a common but non-specific clinical symptom reported in over 100 different diseases.[2] Hemoptysis is responsible for 6.8% of outpatient chest clinic visits,[3] 11% of admissions to the hospital chest service,[4] 38% of patients referred to a chest surgical practice,[5] and up to 15% of all pulmonary consultants.[6] Bronchoscopy is commonly performed, both for anatomic localization of bleeding site and to exclude neoplasm. While there is agreement that patients with focal roentgenographic abnormalities suggestive of malignancy require bronchoscopic evaluation, the indications for patients with normal or non-localizing roentgenographic abnormalities remain controversial. The aim of our study was to define the role of bronchoscopy in localizing the bleeding site and in

determining the etiology of hemoptysis. Aims of the study:

1. To define the role of bronchoscopy in localizing the bleeding site and in determining the etiology of hemoptysis.
2. To determine whether bronchoscopy is useful in hemoptysis with normal chest x-ray.
3. To determine whether early bronchoscopy is better than delayed bronchoscopy.

METHODS

The present study was conducted on patients, attending the Outpatient Department (OPD) and those who were admitted in the wards (IPD) of Department of Tuberculosis and Chest Diseases, Jawaharlal Nehru Medical College Hospital, Aligarh Muslim University, Aligarh. All the patients complaining of hemoptysis were taken up for the study. The study was approved by the local ethics committee.

Basis of selection of patients

Inclusion criteria: Patients with recurrent hemoptysis (hemoptysis of more than 7 days duration) and a normal or non- localizing chest roentgenogram. Patients with recurrent hemoptysis with an abnormal chest roentgenogram not diagnosed by non bronchoscopic methods.

Exclusion criteria: Patients not giving consent for bronchoscopy.

Clinical history and examination of the patient

Detailed clinical history was recorded and the patients were thoroughly examined with a detailed reference to the general physical examination pertaining to the respiratory diseases. The complaints which were evaluated in detail included hemoptysis (amount, time of onset in relation to duration of other symptoms), cough, sputum production, chest pain, dyspnoea, fever, weight loss, anorexia, hoarseness of voice, dysphagia, and symptoms suggestive of malignancy. History of cigarette smoking, cardiopulmonary disease, hematuria and symptoms of nasal, oropharyngeal, laryngeal disease, or gastrointestinal disease were noted, if any.

The presenting quantity of hemoptysis was estimated as best as possible from the patient's history, and was classified arbitrarily according to the severity into mild (<30ml/day), moderate (30-200ml/day), or severe (>200ml/day) depending upon the amount of bleeding.

Investigations

Besides routine lab parameters, chest x-ray, sputum for gram staining and AFB staining were done in all patients. CT scan/ CT guided FNAC or biopsy, percutaneous FNAC or biopsy was done in selected patients.

Fibreoptic bronchoscopy

All the patients underwent bronchoscopy using Olympus (BF Te2e) model in an endoscopy room or bedside. Medical records were analyzed for the quantity and duration of hemoptysis, prior diagnostic procedures, timing of FB (in relation to hemoptysis), endoscopic findings and results of any accessory procedures. Although attempt was made to perform the procedure as soon as possible, FOB was performed up to 10 days following the initial event because of technical problems. Early FOB was defined as FOB performed during active hemoptysis or within 48h after cessation of last episode of hemoptysis. Delayed FOB was defined as FOB performed more than 48 h after bleeding had subsided.

A written and informed consent was taken. Fibreoptic bronchoscopy was done in the morning hours after an overnight fasting. After mild sedation (intramuscular injection of promethazine, 25 mg, with atropine, 0.6 mg, 30 min before the procedure), the nose, pharynx, and upper airways were sprayed with lignocaine (4% solution), and fibreoptic bronchoscopy was performed. Transbronchial anaesthesia was obtained by nebulisation with lignocaine solution. Transnasal route was used for introducing fibreoptic bronchoscope. The tip was advanced under direct vision noting the state of vocal cords; their movements; trachea, carina and bronchi. The normal side was visualized first and then the suspected abnormal side. Mucosal brushings were obtained with a protected brush from the area surrounding the endobronchial lesion and suspected abnormal segments (on radiological basis) in case of patients without endobronchial involvement. Bronchial aspirate was also obtained. Endobronchial biopsy was obtained in patients with endobronchial lesions. Blood from the tracheobronchial wall was cleared by saline, and the bleeding segment/site was detected. This was further confirmed by asking the patient to cough, which resulted in fresh bleeding. Suspicious areas were routinely lavage with sterile saline solution and reexamined to determine if they were the sites of bleeding. The duration of systematic inspection of the airways (to subsegmental levels) ranged from 30 to 40min or less, depending on the urgency of the situation and type of specimen collection, if any.

For the purpose of this study, a definitive (or endoscopic) diagnosis for hemoptysis was made if FOB revealed a specific bleeding lesion, endobronchial mass, or positive and specific microbiology, cytology or histology. An endoscopic diagnosis of bronchitis was made on account of presence of generalized inflammation of the airways (redness and swelling of mucosa), indistinct cartilage rings, and presence of small diverticula in the bronchial mucosa and dilatation of the mucous gland ducts in the bronchial wall. A non-bleeding abnormality was not

considered a definitive lesion but was consistently recorded. A final diagnosis for the hemoptysis was based on the definitive diagnosis and/or review of subsequent historical, radiological, surgical, or autopsy information, if sufficient to establish a probable cause of bleeding.

Statistical analysis: Statistical analysis was done be Chi-square test. p value < 0.05 was taken as significant.

RESULTS

The present prospective study was conducted on 246 patients presenting with hemoptysis. The flow chart shows the pattern of study of the patients.

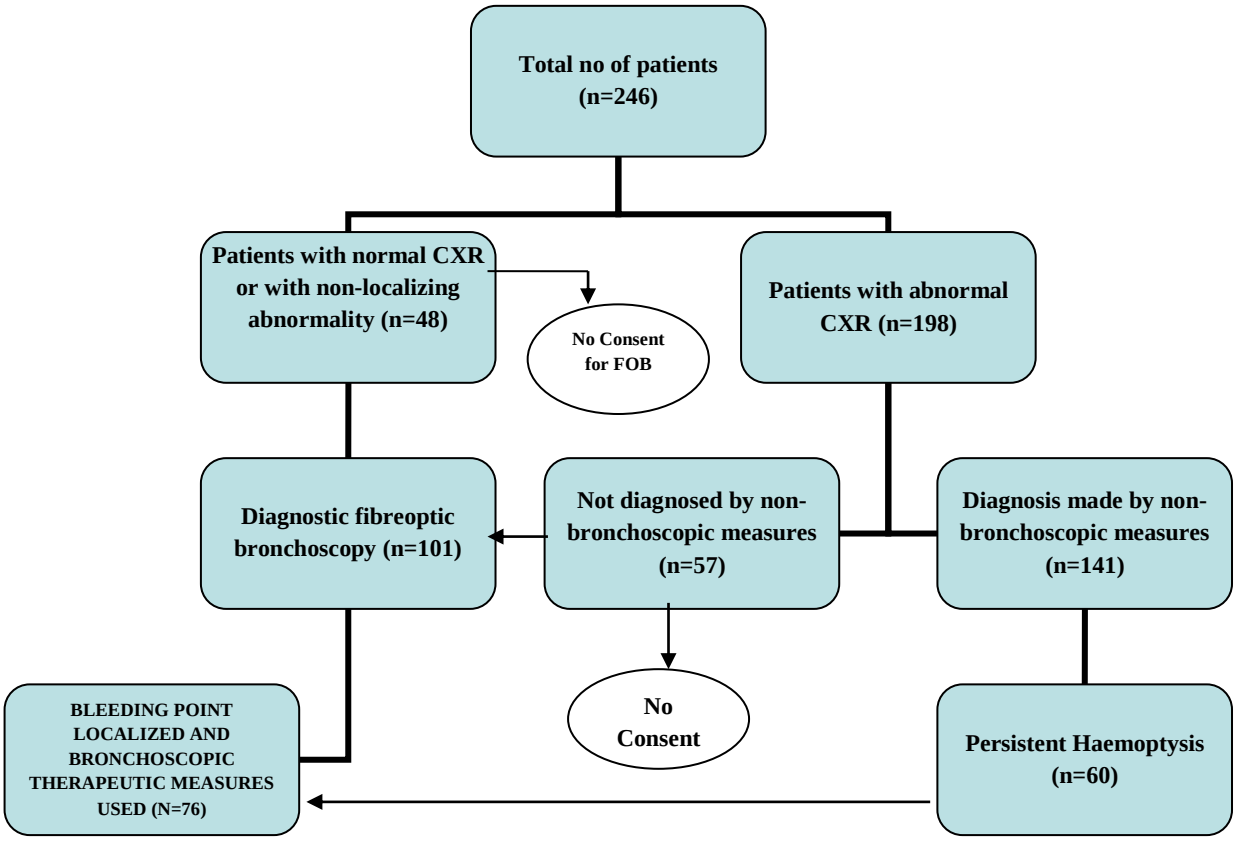

Figure 1: Pattern of study of the patients.

Bronchoscopic diagnosis in patients with normal/ non-localizing and abnormal chest roentgenogram (CXR)

Out of a total of 44 patients in group 1 (patients with normal/ non-localizing CXR), a diagnosis was established in 24 (54.5%) while 17 (38.6%) had a normal bronchoscopy. In 10 patients (22.7%), endoscopic diagnosis of bronchitis was made. In only 4 (9.1%) patients an endobronchial mass was seen on bronchoscopy; 3 of which proved to be carcinomatous on histopathology and 1 was a benign adenoma. In 4 (9.1%) patients, a diagnosis of endobronchial tuberculosis was made on account of histopathology and reports of bronchial aspirate. Active bleeding/bleeding site was localized in 8 (18.1%) patients. In 2 (4.5%) of them, bleeding site was localized to upper respiratory tract (Table 1). In patients with abnormal chest roentgenogram that underwent FOB (group 2), definitive diagnosis was established in 75.4% cases with active bleeding/ bleeding site localized in 59.6%. Twenty cases (35%) were having an endobronchial mass all of which were carcinomatous on histopathology. In 9(15.8%) patients the bronchial aspirate was positive for acid fast bacilli and culture for Mycobacterium tuberculosis. In 9(15.8%) patients, a diagnosis of bronchiectasis was made (Table 1). The difference in diagnostic yield and the bleeding site in group 1 and group 2 was statistically significant ($p<0.05$) (Table 1).

Diagnosis in patients with abnormal chest roentgenogram and hemoptysis diagnosed by non-bronchoscopic methods needing fibreoptic bronchoscopy for persistent hemoptysis

Out of the total of 141 patients with abnormal CXR, where the diagnosis was already made by non-bronchoscopic methods FOB was performed in 56 patients for persistent hemoptysis. Bleeding was localized

in 34(60.7%) patients (Table 2). Localization of the bleeding site:

Of the 157 patients who underwent FOB for recurrent hemoptysis, bleeding was localized in 76 (48.4%) patients. Bleeding was localized to a single point in 17 (22.4%), 15 of them were having bronchogenic carcinoma and in 2 the bleeding site was seen in the upper respiratory tract. Bleeding was localized to a segment in 31 (40.8%) patients and multiple bleeding sites were seen in 28 (36.8%). Of the 29 patients of malignancy in which bleeding was localized, single bleeding site was seen in 15 (51.7%), 10 (34.5%) had bleeding localized to a segment and 4 (13.8%) had multiple bleeding sites. In patients with active tuberculosis, in 10(66.6%) patients bleeding was localized to a segment while 5 (33.3%) had multiple bleeding sites. In patients with bronchiectasis, 10 (66.6%) had multiple bleeding sites while bleeding was localized to a segment in 5 (33.3%) patients (Table 3).

Table 1: Bronchoscopic results in patients with normal / non-localizing and abnormal chest roentgenogram.

Cause	Normal/Non-Localizing Chest Roentgenogram(Group 1)	Abnormal Chest Roentgenogram(Group 2)
	Number of patients (%)	Number of patients (%)
Bronchitis	10(22.7)	5(8.77)
Bronchogenic Carcinoma	3(6.8)	20(35)
Adenoma	1(2.3)	-
Bronchiectasis	4(9)	9(15.8)
Tuberculosis(active)	4(9)	9(15.8)
Clot visualized no anatomic diagnosis	3(6.8)	7(12.3)
Pseudohemoptysis (Bleeding from upper respiratory tract)	2(4.5)	-
Idiopathic(Normal bronchoscopy)	17(38.6)	7(12.3)
Total	**44(100)**	**57(100)**
Diagnosis made by FOB p value	**24(54.5)**	**43(75.4)**
	χ^2=4.854, **p=0.028**	
Localization of Bleeding † p value	**8(18.1)**	**34(59.6)**
	χ^2=17.578, **p<0.001**	

† Statistical analysis done by Chi square test, p value < 0.05 taken as significant

Table 2: Patients with abnormal chest roentgenogram and hemoptysis diagnosed by non-bronchoscopic methods needing fibreoptic bronchoscopy for persistent hemoptysis.

Cause	Number	Percentage	Patients needing FOB for persistent haemoptysis	Localizing of the bleeding site
Bronchitis	4	2.8	-	-
Bronchogenic Carcinoma	22	15.6	15	9
Tuberculosis (active)	31	22	11	8
Tuberculosis (inactive)	24	17	9	6
Bronchiectasis	27	19.1	12	8
Pneumonia	12	8.5	4	1
Congestive Heart Failure	8	5.7	-	-
Lung abscess	8	5.7	3	1
Aspergilloma	5	3.5	2	1
TOTAL	**141**	**100**	**56**	**34**

Table 3: Localization of bleeding site by bronchoscopy in patients with hemoptysis.

Etiology	Bleeding not localized No (%)	Localizing of the bleeding site/s No (%)	Single bleeding point identified No (%)	Bleeding localized to segment No (%)	Multiple bleeding sites identified No (%)
Bronchitis(n=15)	12(80)	3(20)	-	-	3(100)
Malignancy(n=39)	10(25.6)	29(72.4)	15(51.7)	10(34.5)	4(13.8)
Tuberculosis (active) (n=24)	9(37.5)	15(62.5)	-	10(66.6)	5(33.3)
Tuberculosis (inactive) (n=9)	3(33.3)	6(66.6)	-	2(33.3)	4(66.6)
Bronchiectasis(n=25)	7(28)	18(72)	-	6(33.3)	12(66.6)
Pneumonia (n=3)	2(66.6)	1(33.3)	-	1(100)	-
Lung abscess (n=4)	3(75)	1(25)	-	1(100)	-
Aspergilloma (n=2)	-	1(100)	-	1(100)	-
Idiopathic(n=34)	34(100)	-	-	-	-
Pseudohemoptysis Bleeding from upper respiratory tract(2)	-	2(100)	2(100)	-	-
TOTAL(157)	**81(51.6)**	**76(48.4)**	**17(22.4)**	**31(40.8)**	**28(36.8)**

Timing of bronchoscopy

Early bronchoscopy (FOB performed within 2 days of the last episode of hemoptysis) was performed in 89 patients (56.7%), and delayed FOB was performed in the remaining 68(43.3%) patients. Of the 89 patient who underwent early FOB, bleeding site was localized in 56(62.9%), patients while the yield was lower (29.4%) in patients who underwent delayed FOB. This distribution reflected the clinical impression that an early FOB would yield more diagnostic information than a delayed FOB. The likelihood of visualizing active bleeding / localizing the site was significantly higher with early versus delayed FOB, respectively ($p<0.05$).

DISCUSSION

The role of flexible fibreoptic bronchoscopy in the investigation of patients with hemoptysis and a localizing abnormality on chest x-ray is undisputed;[7,8] there is less agreement about the need of this procedure in patients with a normal chest x-ray. It is indicated to rule out the presence of a foreign body or to localize a bleeding site but in most cases it is done to exclude malignancy. A large number of studies have been done; some have reported a high incidence of bronchial carcinomas in such patients,[9] whereas others have found no tumours suggesting bronchoscopy is unnecessary.[10] In our study, the diagnostic yield of FOB in patients with hemoptysis with a normal or nonlocalizing chest radiograph was 54.5%. This was comparable with the results of O'Neil et al.[11] that made a definitive diagnosis in 52.1% of his patients. Heaton[12] made a specific diagnosis in only 19.5% patients. However, they did not include bronchitis and bronchiectasis as an endoscopic diagnosis. Adelman et al in his study on cryptogenic hemoptysis bronchoscopically confirmed bronchitis in 64%; rest had either bleeding only (16.4%) or a normal tracheobronchial tree (19.4%).[13] In our study, malignancy was found in only 9.1% of the patients. This was comparable with the data from the previous studies which have reported bronchogenic carcinoma to be present in 4% to 22% of patients with hemoptysis and normal or nonlocalizing chest radiographs.[9,12,14-17] Specifically, Lederle and coworkers found bronchogenic carcinoma in 4.7% of 106 bronchoscopies performed in men over age 40 with normal and nonlocalizing chest radiographs.[27] Features associated with bronchogenic cancer in this series included smoking history greater than 20 pack-years and a centrally obscuring abnormality, but not a large volume of coughed blood. In our study, the 4 patients diagnosed as neoplasm were males in the age group of 50-69 years, having a significant history of smoking and presenting with recurrent hemoptysis. Although uncommon, bronchogenic cancer has been described in patients younger than age 40 and bronchoscopy should be considered in these patients as well. Snider reported that 5% of 955 patients with bronchogenic carcinoma were less than 45 years of age19. Similarly, Cortese and colleagues reported that 5.5% of patients with radiographically occult lung cancer were younger than age 5020. Table 4 shows the comparison of the present study with that of the previous studies. The yield of bronchoscopy may be increased in the presence of several clinical features (especially when cancer is suspected) including age over 40, bleeding duration exceeding 1 week, volume of expectorated blood greater than 30 mL, a smoking history over 40 pack-years, and male gender.[7,11,21-23]

The diagnostic yield of flexible fibreoptic bronchoscopy in patients with hemoptysis and a localizing abnormality on chest x-ray was 75.4%, with carcinoma in 35% of the cases. This was comparable with the yield of 80% from previous studies, with carcinoma comprising one-third of cases.[7-9,11,14,19,24,25] The diagnostic yield of flexible fibreoptic bronchoscopy in patients with hemoptysis and a localizing abnormality on chest x-ray was 75.4%, with carcinoma in 35% of the cases. This was comparable with the yield of 80% from previous studies, with carcinoma comprising one-third of cases.[7-9,11,14,19,24,25]

Table 4: Comparison of incidence of malignancy in patients with hemoptysis and normal chest X-ray.

Study	Year	Number of patients with normal chest X-ray	Number of patients with malignancy (%)
Zavala et al[20]	1975	55	9 (16.3)
Heimer et al[18]	1985	45	0 (0.0)
Adelman et al[13]	1985	67	1 (1.4)
Jackson et al[15]	1985	48	2 (4.1)
Heaton et al[31]	1987	41	4 (9.7)
Lederle et al[27]	1989	106	6 (5.6)
Suri et al[35]	1990	60	4 (6.6)
Jindal et al[29]	1990	155	7 (4.5)
Sharma et al[30]	1991	53	0 (0.0)
Present study		**44**	**3(6.82)**

Using all available methods, overall success rates for specifically localizing bleeding have been 75% to 93%.[26] Lateralizing the bleeding source without more specific lobar localization has reportedly been accomplished in 95% of instances.[21] The yield of individual strategies for localizing the bleeding site has been assessed in a series of 105 patients with hemoptysis. Patients' self-assessments were least useful, offered by only 10% of patients, and inaccurate in 30% of these. Clinical examination correctly localized the bleeding source in 43% of patients but was inaccurate 2% of the time. Chest radiographs were correct in 60% of patients and no instance of inaccuracy was found. Finally, bronchoscopy during active bleeding was most accurate (86% of evaluations), but was possible in only a minority (20%) of all patients in that series.[4] Although bronchoscopy remains the best diagnostic and localizing modality in hemoptysis, it may not pinpoint the bleeding at a specific site. In our study, of all the 157 patients, bleeding was localized in 76 (48.4%). It was localized to a single point in 17(10.8%), 15 of whom were having bronchogenic carcinoma and in 2 the bleeding site was seen in the upper respiratory tract. Bleeding was localized to a segment in 31 (19.7%) patients and multiple bleeding sites were seen in 28 (17.8%).

Smiddy and Elliot performed flexible fibreoptic bronchoscopy in 71 patients with active hemoptysis and identified a single bleeding point in 46.5%. Bleeding was localized to a bronchopulmonary segment in 38.0% of patients, multiple bleeding sites were identified in 8.45%, and the bleeding site could not be localized in 7.0 %.[26]

Jackson and Diamond recommended that bronchoscopy be postponed until after hemoptysis has subsided for fear of reactivating bleeding.[28] However, the consensus is that bronchoscopy is both safe and highly informative during the period of active bleeding. Of the 89 patient who underwent early FOB, bleeding site was localized in 56 (62.9%), patients while the yield was lower (29.4%) in patients who underwent delayed FOB.

Table 5 presents the comparison of the present study with the previously available studies comparing early versus delayed bronchoscopy,[4,14,31] all of which show a higher rate of successful localization with early bronchoscopy.

Table 5: A Summary of Available Studies of Delayed versus Immediate Bronchoscopy for Hemoptysis.

			Yield of Locating Bleeding (in %)	
Study	**Number**	**Bronchoscopy**	**Delayed**	**Early**
Pursel[4], 1961	105	Rigid	52	86
Smiddy[26],1973	71(active)	Flexible	NS	93
Gong[14], 1981	129	Flexible	11	34
Bobrowitz[33],1983	25	Flexible	NS	86
Rath[24], 1973	31	Flexible	NS	68
Corey[34], 1987	59	NS	NS	39
Saumench[3],1989	36	Flexible	50	91
Present study,	157	Flexible	29.4	62.9

NS, not stated

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However, careful analysis of the diagnostic impact of bronchoscopy has shown that although active bleeding and the site of bleeding are visualized more commonly with early versus delayed bronchoscopy (34% versus 11%, respectively); the timing of bronchoscopy rarely alters the suspected cause of bleeding or overall patient management. Early bronchoscopy is recommended because localizing the source can be critical if massive hemoptysis develops later, and because early bronchoscopy also lessens the chance that an old clot will be redistributed by coughing or that gravitational pooling from the true bleeding site will occur.[32]

To conclude, bronchoscopy should be performed to evaluate hemoptysis unless a clear cause is already established. It is a useful technique to exclude malignancy in patients with a normal/non-localizing CXR especially with age > 40years, having a significant history of smoking and history of recurrent hemoptysis. Bronchoscopy is a useful procedure to localize the bleeding site. The yield can be improved if it is performed as early as possible to the last episode of hemoptysis.

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