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Dysphagia

Epidemiology and Dysphagia

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Abstract. With few exceptions, epidemiology of dysphagia is unexplored, particularly with regard to risk and protective factors, and underutilized. The range of incidence of dysphagia in selected primary diagnoses often associated with dysphagia is summarized.

Key words: Deglutition — Deglutition disorders — Digestive tract — Epidemiology — Physiopathology — Systemic diseases.

Value of Epidemiology

The usual goal of epidemiologic studies is to shed light on the underlying factors that predispose a person manifesting the symptoms of a particular disease. However, epidemiologic analyses can also concentrate on factors that make the appearance of a disease less likely. These factors are typically called "risk" factors in the case of those factors that predispose toward a disease and "protective" factors if they, when present, seem to make the development of a disease less likely.

With generous doses of luck, perseverance, cooperation, and dedication on the part of the investigative teams (rarely does a single team succeed in elucidating a disease), the identification of these risk and protective factors may give clinicians and basic scientists a toehold from which they can begin to examine thoughtfully and unravel methodically the fundamental disease processes. For example, cultural differences between people of Japanese ancestry reared in Japan and America helped point out the role of dietary sodium in the genesis of hypertension (Japanese reared in Japan have a much higher incidence of hypertension than people of Japanese ancestry reared in America; native Japanese have a much higher consumption of table salt than Japanese-Americans).

Though many breakthroughs have been accomplished through epidemiologic techniques, the vast bulk of epidemiologic clues today fall on decidedly barren ground. It has been known for some time that people who spend their first 15 years in the northern U.S. have a much higher incidence of multiple sclerosis than people who grow up in the southern U.S., yet this knowledge has not led to any improvements in the diagnosis or treatment of this miserable disease. The knowledge that eating disorders are much more common in women than in men has not been particularly useful in the understanding of this disorder. Indeed, we do not have any idea as to whether these gender differences are hormonal or cultural in origin or perhaps due to some other as yet unsuspected factor.

Moreover, it is only a slight exaggeration to state that epidemiologists have never proved anything. This is not to say that epidemiologists do not find "truth." They can collect mountains of impressive evidence, but almost never can they say they have collected proof. The clearest example of this can be seen in epidemiologic studies on the relationships between cigarette smoking and various diseases. Virtually no one outside the tobacco industry disputes the hypothesis that cigarettes cause lung cancer and other diseases. Yet the tobacco lobby says, quite correctly, that no one has proven that smoking causes these maladies. Lobbyists argue, that, yes, there is a connection, but the implication that the connection is cause and effect remains conjectural. They are right. It will never be proven that cigarette smoking causes lung cancer. A prospective experiment in which thousands of people are randomly assigned to be lifetime smokers or nonsmokers would have to be conducted over a period of decades. Such an experiment would be highly unethical, prohibitively expensive, and logistically impractical. To my mind, the connection between cigarettes and disease is clear and further study would only serve to divert

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crucial resources from other unanswered questions. I believe that, in this regard, the epidemiologists have found truth even if they cannot prove it. Their lack of proof does not infer lack of connection.

So, if most epidemiologic clues fall on fallow ground and epidemiologists cannot prove anything, why should we be interested in the epidemiology of dysphagia? Because epidemiology is, in the right circumstances, too powerful a tool to be ignored. Properly used, it can provide important clues that can increase the speed, efficiency, and effectiveness of scientific investigation and clinical treatment.

In addition, epidemiologic studies can help us make informed decisions on a rational distribution of health care resources. Americans are belatedly coming to grips with the concept that not all people have a right to limitless health care and financial resources irrespective of their prognosis. Epidemiologists can, in the best democratic tradition, help ensure that the greatest good is provided to the greatest number of people.

Epidemiologic Concepts

There are several simple, but indispensable concepts without which epidemiology would not be a science. (There is a large element of art in epidemiology as well. Knowing where to start looking for epidemiologic clues is arguably as much intuition (art) as science.) Most readers will have a basic understanding of these concepts but I will use this opportunity to be explicit and specific on the definition of these concepts.

The first of these is the concept of prevalence which is a measure of the extent of morbidity due to a specific disease at a specific time. The mathematical definition is as follows:

$$\text{Prevalence} = C/P$$

where C = number of cases of disease in the population at a specified time and P = number of persons in the population at that specified time.

Incidence is also a measure of the extent of morbidity due to a specific disease, but is used for different purposes:

$$\text{Incidence} = N/R$$

where N = number of NEW cases of a disease occurring in the population during a specific period of time and R = number of persons exposed to the risk of developing the disease during that period of time.

Note that the time units are different. Units of prevalence are usually given in cases/100,000 population whereas units of incidence are stated as cases/100,000 population/year. Prevalence includes extant cases at a specific time whereas incidence includes those cases that appear (and may disappear either through death or recovery) during a time period, usually a year. Thus the duration of the condition is also important for prevalence. In fact, the prevalence is equal to the product of incidence and the average duration of the disease. All other factors equal, a disease (e.g., chronic hepatitis) with a long duration will have a higher prevalence than a disease with a shorter duration (e.g., chicken pox).

The mortality of a disease directly affects prevalence but not incidence. Incidence is independent of whether the patient lives or dies, but if the patient dies, he or she will not be present to be counted when prevalence is being measured. Thus, all other factors being equal, diseases with a high mortality will have a lower prevalence than diseases with low mortality.

Another simple but useful epidemiologic concept is that of risk factors, or their inverse, protective factors. Risk factors for a disease are those which, when present in a specific person, increase the probability that that person will develop the disease or condition in question. For example, risk factors for stroke include hypertension and a history of cigarette smoking, among many others. People with hypertension are, on average, more likely to suffer from a stroke than similar people without hypertension. Smokers are more likely to suffer from strokes than nonsmokers.

The inverse of risk factors, protective factors, for a specific disease or condition are those factors which, when present in an individual, make it less likely that he or she will develop the disease or condition. It has been convincingly shown that the ingestion of modest doses of aspirin reduces the incidence of myocardial infarction. Thus, aspirin ingestion is a protective factor for myocardial infarction.

Some risk factors can be modified whereas others cannot. Age, race, and gender cannot be modified (persons with sex change operations retain their genetic composition though their hormonal milieu may be altered). Cigarette consumption, exercise habits, and diets, however, can be modified. Although it is difficult for people to change ingrained habits, it can be done. Cigarette smoking and distilled liquor consumption are on the decline and have been for many years. Many people are increasingly interested in consuming lower fat, lower calorie foods. Are these changes in behavior of sufficient magnitude to influence health? Almost certainly, at least for some diseases. The incidence of stroke, for example, has been declining steadily for many years. Although the reasons for this decline are not known exactly, it is accepted widely that the increased emphasis on diet and

exercise and a reduction in tobacco use are at least partially responsible.

Scientists, including epidemiologists, are happiest when they can quantify the magnitude and strength of the relationship between factors. Can we quantify the importance of a risk or protective factor? The short answer is yes. There are two major variables that describe the importance of risk and protective factors. The first is the so-called odds ratio, the ratio of two sets of odds. The first set of odds is the odds that a person with a particular risk (or protective factor) will develop a disease or condition. The second set of odds of interest is the odds that a person who lacks the risk (or protective) factor will develop the disease. For example, suppose that the odds of a pack-a-day smoker of developing lung cancer are 1:10 and the odds of a nonsmoker of developing lung cancer are 1:100. The odds ratio for the development of lung cancers in smokers, then, is 1:10/1:100 or 10. All other factors being equal, the odds of smokers developing lung cancer are 10 times the odds of nonsmokers.

The second variable that describes the strength of the relationship between risk factors and disease is the so-called relative risk. It is closely related to, but not identical with, the odds ratio. As will be explained later, in the case of very rare diseases or conditions, differences in relative risk and the odds ratio are mathematically trivial. Relative risk is the probability (risk) of a person with a risk (or protective) factor developing a disease or condition relative to the probability of a person without the risk (or protective) factor developing the disease or condition. For example, suppose that the fraction of people with a certain trait who develop a disease is 10% and the fraction of people without that trait who develop the disease is 1%. The relative risk then is 10—people with the trait are 10 times more likely than people without it to develop the disease.

Let us now turn to the difference between the odds ratio and the relative risk. In the example given for odds ratio, the odds of developing the disease or condition were 1:10. The probability of these people developing the disease is not 1 in 10, but 1 in 11 or approximately 9%. The probability of nonsmokers is 1:100 or approximately 1%. The odds ratio is 10, but the relative risk is 9. In the case of rare diseases, the odds ratio and relative risk are virtually identical. For example, suppose that the odds of a person with a given trait developing a certain disease is 1:1,000 and the odds for a person without that trait are 1:2,000. The odds ratio is thus 2.00. The relative risk is 1/1,001 (0.000999) divided by 1/2,001 (0.00049975) or 1.99992. Obviously, the rarer the disease, the smaller the difference between the odds ratio and the relative risk and, conversely, the more common the disease or condition, the larger the difference between these two variables.

How can knowledge of these parameters, incidence, prevalence, and some measure of the strength of association between risk (or protective) factors and disease be useful to a person interested in dysphagia? Broadly speaking, knowledge of the incidence and prevalence help us to plan for efficient allocation of resources necessary to treat the condition. When all other factors are equal, if the incidence and/or prevalence are increasing (as in the case of AIDS), societies usually decide to dedicate more resources (time, money) than if the incidence and/or prevalence are falling (stroke). Knowledge of risk and protective factors can improve treatment and diagnosis of disease, first through modification of those risk factors that can be modified and secondly through the clues provided by the risk or protective factors regarding the underlying disease process.

Epidemiologic Aspects of Dysphagia

It seems to many that there is an increasing emphasis on dysphagia. Does the literature support this impression? In an effort to find out, I looked at the number of references appearing in the literature surveyed by Index Medicus over the past 13 years. The results are shown in Figure 1. There is a modest but steady increase in the number of articles pertaining to dysphagia, particularly for those articles for which dysphagia is a focus.

As another index of how important dysphagia is thought to be now compared to 10 years ago, I looked at the reported incidence of dysphagia as a primary or secondary diagnosis in patients hospitalized in Maryland. In the decade between 1979 and 1989, the incidence of reported dysphagia rose from 3/1,000 to 10/1,000. We cannot tell if this increase is due to an actual increase in the true incidence of dysphagia or simply that more people are attentive to the presence of dysphagia and report it. It is somewhat ironic, that as in most aspects of dysphagia, using epidemiologic techniques (incidence of reports on dysphagia) gives us clues, but no definitive proof, regarding the current level of interest in dysphagia.

Dysphagia itself is not a disease, but rather a symptom of one or more underlying pathologies. A complete list of the conditions associated with dysphagia has been published [1]. To have a complete knowledge of the epidemiology of dysphagia, we would need to know the prevalence and incidence of dysphagia for each of those conditions and the risk and protective factors associated with the presence of dysphagia with each of the conditions. In other words, we would like to be able to complete all rows and columns of Table 1.

The incidence of the underlying condition is usually fairly easy to get. For example, there is a book

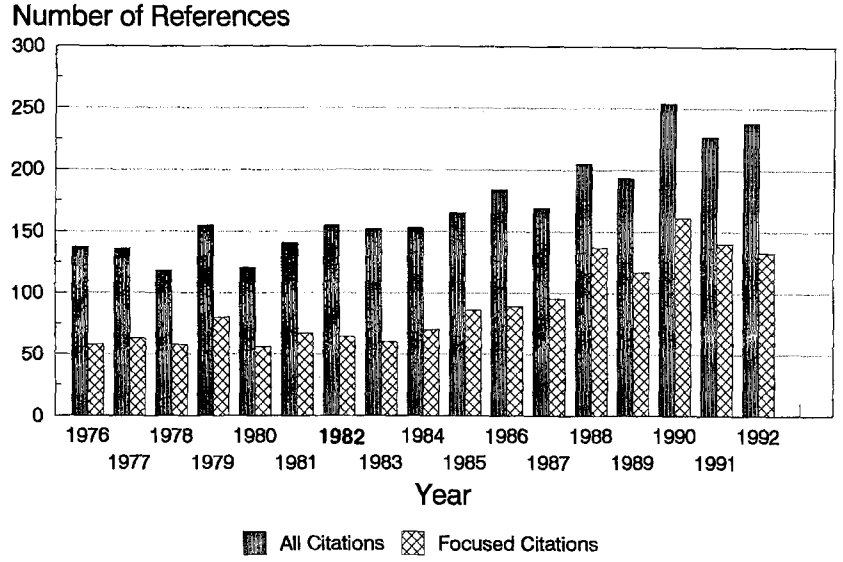

Fig. 1. References to deglutition disorders in Index Medicus by year.

Table 1. Desired epidemiologic information desired for primary diagnoses associated with dysphagia

Disease	Incidence of dysphagia	Prevalence of dysphagia	Risk factors	Protective factors
Stroke	A/100,000/year	B/100,000	Smoking, high sodium intake	Low sodium intake
Parkinsons disease	C/100,000/year	D/100,000	?	?
Amyotrophic lateral sclerosis	E/100,000/year	F/100,000	?	?
Etc.				

published by the National Center for Health Statistics entitled *Detailed Diagnoses and Procedures for Patients Discharged from Short-Stay Hospitals* that gives the incidence for most ICD codes of hospitalized patients. However, this obviously would not be complete because no information is given in it for nonhospitalized patients, who, after all, are much more common than hospitalized patients. There are several nationwide surveys of health status that are useful, however. Most schools of public health have computer tapes containing this information.

The prevalence of the underlying condition is more difficult to determine. Knowledge of prevalence requires an actual survey because the required information typically cannot be gleaned from existing information such as hospital records, physical records, and the like. Risk and protective factors are also generally determined from surveys. For uncommon diseases and conditions, reliable information on risk and protective factors is difficult to gather because of the small numbers and the large number of possible combinations of factors involved.

Dysphagia in Selected Conditions

What do we know about the epidemiology (incidence, prevalence, risk factors) of dysphagia? In the particular instance of dysphagia, we typically are more interested in the incidence, prevalence and risk factors for dysphagia within a specific disease than in the population as a whole. We are more interested in how many people with stroke have dysphagia than we are in how many people in the country have dysphagia. This allows us to focus our efforts and not miss the individual trees for the forest.

What are the most frequent primary diagnoses associated with dysphagia? Let us look at the most common primary diagnoses of hospitalized patients who report having dysphagia. These are listed in Table 2, the data being abstracted from the Maryland Health Services Cost Review Commission data tapes for 1989.

The table shows that if you have a hospitalized patient complaining of dysphagia, the most common primary diagnosis (from a coder's point of view, the primary diagnosis is the primary reason for being in the

Table 2. Primary diagnoses for hospitalized Maryland patients with dysphagia

ICD codes	Description of primary diagnosis	Cases
780–799	Symptoms, signs, and ill-defined conditions	165
390–459	Diseases of the circulatory system	151
460–519	Diseases of the respiratory system	117
240–279	Endocrine, nutritional, and disease anbd immunity disorders	85
V codes	Supplementary	67
520–579	Diseases of the digestive system	66
140–239	Neoplasms	58
800–899	Injury and poisoning	30
1–139	Infectious and parasitic diseases	29
320–389	Diseases of the nervous system and sense organs	29
710–739	Diseases of the musculoskeletal system and connective tissue	16
	Diseases of the blood and blood-forming organs	<10
	Mental disorders	
	Diseases of the GU system	
	Complications of pregnancy, childbirth, and the puerperium	
	Diseases of the skin and subcutaneous tissue	
	Congenital anomalies	
	Certain conditions originating in the perinatal period	

hospital, which may or may not reflect the underlying disease process responsible for dysphagia) is "symptoms, signs and ill-defined conditions." This information is not particularly useful. The second most common primary diagnosis is "diseases of the circulatory system," primarily stroke. The third most common primary diagnosis is "diseases of the respiratory system," primarily pneumonitis.

Dysphagia in the General Population

There are three reports on dysphagia in the general population, two from Sweden and one from the Netherlands. The first study [2] was directed at the esophagus. In a sample of 55-year-olds, 34% were found to have esophageal dysfunction as determined by manometric measurements or acid perfusion test. "Dysphagia" was reported in 13% of the patients with normal esophageal function and 27% of the patients with esophageal dysfunction. If one extrapolates these figures to their sample, the overall incidence of dysphagia in 55-year-old Swedes is 22.3%. No mention was made of gender differences.

Lindgren and Janzon [3] examined a somewhat older group of Swedes (50-79 years). Nineteen (13 males, 6 females) of 556 patients answering a questionnaire reported obstructive symptoms (1.6%) and 116 (49 males, 67 females) reported globus sensation (20.9%). Globus sensation increased slightly with increasing age but obstructive symptoms remained fairly constant over the age range tested.

In an older group (aged 87 or more) 16% of 130 Dutch people who lived in their own homes (nursing home patients were not studied) reported symptoms of dysphagia [4]. Dysphagia was not related to age, sex, or mental status as measured by Minimental State score. The dysphagia was reported to be particularly severe in 6 of the subjects, none of whom had volunteered symptoms of dysphagia before the survey. This suggests that dysphagia in the elderly may be more common than supposed and that patients will complain of the symptoms only if specifically asked.

Prolonged (>20 days) orotracheal intubation has been associated with a variety of videofluorographic swallowing defects in patients without evidence of neurologic disorders but these defects typically abated after unspecified therapy. It is possible that the defects were simply caused by the presence of the foreign tube [5].

Stroke

Stroke is a fairly common occurrence in the U.S. and dysphagia is a frequent complication of stroke, particularly in the first days after stroke. Consequently, stroke is probably the most common cause of dysphagia. However, the dysphagia often resolves spontaneously during the recovery process. Thus, the reported incidence depends to a great extent on the time post stroke. Forty-one of 91 patients studied within 13 days of stroke reported symptoms of dysphagia [6]. In another study on acute stroke, 33% of the patients had symptoms of dysphagia, but at discharge fully three-quarters were on full oral diets [7]. Nearly a third of patients with single hemispheric strokes were dysphagic if measured within 2 days of onset [8]. However, only 16% of 411 stroke patients admitted to a rehabilitation service showed evidence of

dysphagia [9]. In this study, stroke patients with dysphagia had lower levels of verbal expression and functional communication and had lower Barthel Index scores (a measure of functional capacity) and longer lengths of stay than nondysphagic stroke patients. However, no differences were observed in auditory comprehension or cognition. The highest fraction of stroke patients reported to have dysphagia were those referred by swallowing specialists [10]. This high percentage probably reflects the fact that the referred patients were a highly select group who had been observed by their caregivers to have trouble swallowing. Pharyngeal transit times have been suggested for measuring the progress of stroke patients with dysphagia [11].

Parkinson's Disease

Parkinson's disease is far less common than stroke, but not rare. Dysphagia-related observations include vallecular stasis, reduced pharyngeal peristalsis, esophageal dilatation, esophageal reflux, and esophageal dysmotility [12,13]. In one study [14], 50% of parkinsonian patients complained of dysphagia; this included some patients who had relatively normal swallows on radiography. In another study [15], 90% of parkinsonian patients with complaints of dysphagia also had videofluorographic abnormalities. In a third study [16], only half of patients with documented swallowing disorders admitted to swallowing difficulties. It is clear that the actual incidence of dysphagia in Parkinson's disease is difficult to determine. In any case, levodopa has been reported to improve symptoms of dysphagia in these patients [17].

Multiple Sclerosis

Multiple sclerosis is also not a rare disease, with an incidence of one per several thousand in the U.S. It is usually a slowly progressive disease marked by remissions and exacerbations. It is characterized by idiopathic demyelination in the brain and spinal cord. Some patients may remain in remission for one or two decades and others die from complications within a year. Despite the relatively high incidence of multiple sclerosis (1:2,000 in temperate climates, 1:10,000 in tropics), references to dysphagia in multiple sclerosis are rare. A Medline search from 1966 to 1993 revealed a single article, which happened to be a review article, that dealt with dysphagia in multiple sclerosis. According to this article, "Dysphagia is not a frequent complaint in patients with multiple sclerosis but when it does occur, it tends to be associated with more severe disease and is possibly lethal."[18] No supporting evidence is given for this statement.

Muscular Dystrophy

Despite the severity and relatively high prevalence of muscular dystrophy (approximately 4/100,000), a Medline search on muscular dystrophy and dysphagia yielded primarily information on oculopharyngeal muscular dystrophy, a heretofore uncommon condition with a strong genetic basis, that is becoming more frequently diagnosed in the general population. As could be predicted from the name (oculopharyngeal muscular dystrophy), "dysphagia is very common in those who have it" [19]. It has been reported that cricopharyngeal myotomy is often effective [19,20], though this is not universally accepted.

Amyotrophic Lateral Sclerosis (ALS)

ALS is characterized by progressive muscular weakness and atrophy as a consequence of anterior horn cell dysfunction. It has a prevalence of approximately 5/100,000. Most patients die within a few years, often as a consequence of dysphagia or respiratory insufficiency. No substantive treatment exists. Dysphagia is often the first symptom of this disease [21]. However, it typically appears an average of 4 months after onset of the disease [22]. Most patients ultimately show oral or pharyngeal involvement [23].

Huntington's Disease

Kagel and Leopold [24] described two groups of patients with Huntington's disease. One was a hyperkinetic group characterized by rapid lingual chorea, swallow incoordination, repetitive swallows, prolonged laryngeal elevation, inability to stop respiration, and frequent eructations. The other rigid-bradykinetic group frequently had abnormalities involving mandibular rigidity, slow lingual chorea, coughing with food ingestion, and choking with liquids. Another study [25] utilized 14 patients and 28 non-Huntington's demented patients and reported that the symptoms of dysphagia generally appeared about 7 years after the onset of the disease and that dysphagia or complications of dysphagia (pneumonia) were usually the cause of death. Many of the patients were gluttonous, with impulsive swallowing and retention. The dysphagia sometimes cleared spontaneously and may have been exacerbated by the administration of tetrabenazine [26,27]. The prevalence of Huntington's disease is approximately 3-6/100,000.

Polio

Acute polio is virtually nonexistent in the U.S. today so that the information that exists pertains to chronic pa-

Table 3. Summary of epidemiology parameters in conditions associated with dysphagia

Group	Low	High	Comments
General population	16%	22%	Aged 55 or older only
Polio	18	27	Sample may be biased
Cerebral palsy	27	27	Only one study
Stroke	16	100	Depends on time post stroke and diligence
Parkinsons disease	50%		Varying literature reports
Multiple sclerosis	"Not frequent"		Very little information
Huntingtons disease	Near 0	95+	Appears late in course of disease
ALS	48	100	Frequently a presenting symptom
Polymyositis	12	54	Distal esophageal dysfunction common
Diabetes			Dysphagia infrequently recognized as a complication
Rheumatoid arthritis	28	28	One study, all females
Oculopharyngeal MD	"Very common"		Infrequent or rarely diagnosed disease

tients. One study [28] which utilized responders from a polio support group (and therefore had a higher than average interest in polio matters) reported that 27% of 109 responders reported intermittent or consistent swallowing difficulties. Twenty-one of these 29 were given videofluoroscopic swallowing studies. Eighty-one percent of those so tested had abnormal pharyngeal transit, 19% had an impaired swallow reflex, and 43% exhibited impaired bolus control. An earlier study [29] had reported the incidence of dysphagia in polio survivors to be about 20%.

Cerebral Palsy

Cerebral palsy syndrome is a general term applicable to nonprogressive motor disorders resulting from perinatal or gestational damage to the central nervous system which results in disturbances of voluntary movement. It occurs in 1 in 500 to 1 in 1,000 births. Most cerebral palsy patients have visible drooling [30]. Twenty-seven percent of 56 patients had radiologic or clinical evidence of dysphagia. The dysphagia in these patients was correlated with bite reflexes, slow oral intake, poor trunk control, feeding dependence, anticonvulsant medication, coughing with meals, and pneumonia. Age, cause of cerebral palsy, and type of cerebral palsy were not related to the incidence of dysphagia.

Polymyositis/Dermatomyositis

Polymyositis is an uncommon (1-5/million, about four times that in black females) systemic connective tissue disease with inflammatory and degenerative changes in the muscles. Dermatomyositis is similar but involves skin changes. Malignancies are often associated with these diseases, particularly in men, although the diseases are more common in women. The age at onset is generally in early middle age but either disease may appear in children or the elderly. The prognosis varies from eventual recovery over a period of weeks to death, often as a consequence of the dysphagia accompanying the disease. Many of these patients have distal esophageal dysfunction [31]. Survivorship is significantly reduced in polymyositis patients with dysphagia with only 10% survivorship at 7 years [32].

Diabetes Mellitus

Diabetes mellitus is a common disease in the U.S., with a total of approximately 10 million people affected; approximately 5% of these are juvenile-onset diabetics. Nevertheless, in 1967 [33] it was stated, "The literature contains almost no data concerning esophageal pathology and dysfunction in diabetes mellitus." This statement remains true today although the authors went on to examine 14 patients with evidence of neuropathy/gastroenteropathology and found cineradiographic evidence of dysfunction in 12. This dysfunction was manifested mainly by a decrease in the primary peristaltic wave, a delay in esophageal emptying if the patient was recumbent, and the presence of tertiary peristaltic contractions. All patients could easily initiate swallows and none showed retrograde movement from the esophagus to the larynx. They quantitated the disorder in 8 of the 12 in a later study utilizing manometry [34]. Langille et al. [35] also reported delayed emptying, esophageal dilatation, and a decrease in primary and secondary peristaltic waves. Herzberg [36] presented a case report in which an elderly woman complaining of chronic pain over the top of her head and temples. She later developed dysphagia which was alleviated within hours of controlling her occult diabetic ketosis with insulin.

Rheumatoid Arthritis

Dysphagia is occasionally associated with rheumatoid arthritis, a very common disease affecting over 30 million people in the U.S. It has been estimated that a third

of Americans aged 45–65 have this disease. Some of the symptoms seen in rheumatoid arthritis that can give rise to swallowing difficulties include xerostomia, cervical spine abnormalities, arthritic involvement of the temporomandibular joints, rheumatic involvement of the larynx, and impairment of the esophageal musculature [37–41]. Geterud et al. [42] examined 29 female patients with classic or definite rheumatoid arthritis and compared them with 30 age-matched controls. Xerostomia was seen in 6 of the 29 rheumatoid arthritis patients but none of the 30 control patients. Eight of the rheumatoid arthritis patients but only one of the control patients complained of swallowing difficulties. Esophageal manometry showed smaller amplitude peristaltic pressures in the proximal esophagus of the patients, suggesting striated muscle dysfunction. There was no correlation between esophageal pressures and dysphagia. However, dysphagia was related to the severity of the rheumatoid arthritis.

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