LITERATURE REVIEW

Outcomes assessment in chronic rhinosinusitis

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ABSTRACT

Chronic rhinosinusitis is a very frequent pathology found in current practice. Many treatment modalities, medical and surgical, have been developed along the years. The field of "outcomes research" grew out of these questions: how to assess treatment outcome, and comparisons of outcomes, cost, and effectiveness between different treatments. Some of the first outcomes studies in the specialty were in chronic rhinosinusitis.
KEYWORDS: chronic rhinosinusitis, outcomes research

HISTORY OF OUTCOMES RESEARCH

In the United States, outcomes research was originally conceived and described as potentially a new type of study - of populations and outcomes after diverse treatments - which would help answer questions about the best treatments for different conditions[1]. Initial hopes were that outcomes-based studies would be able to "find out what works in medicine"[2].

Much of the impetus for the development of outcomes research in the 1980s was the surprising findings of marked differences in health care utilization rates for techniques and procedures in different geographic regions. These differences could not be explained by underlying differences in disease prevalence or severity, insurance status, or the patients themselves. Despite apparent similarities, some groups received a markedly different frequency and intensity of health care utilization[3].

These large differences prompted the question: what are the outcomes we expect for treatment of disease? When a disease is potentially fatal, then mortality is an obvious outcome. However, many common diseases have significant impacts without causing death, and the outcome assessment is less straightforward.

The field of "outcomes research" grew out of these questions: how to assess treatment outcome, and comparisons of outcomes, cost and effectiveness between different treatments. In Otolaryngology-Head and Neck Surgery, outcomes assessment really started in the early 1990s, and outcomes assessment is now beginning to mature into a standard part of clinical research, and even day-to-day clinical practice.

OUTCOMES ASSESSMENT IN OTOLARYNGOLOGY – HEAD & NECK SURGERY

Some of the first outcomes studies in the specialty were actually in chronic rhinosinusitis (CRS). Drs. Richard Gliklich and Ralph Metson in Boston validated a disease-specific quality of life (QOL) instrument for CRS - the Chronic Sinusitis Survey[4,5] - and also did a prospective outcomes-based study using that instrument[6]. Their work showed that CRS has a significant QOL impact, and also that endoscopic sinus surgery results in very large improvement in disease-specific QOL - almost back to population baseline levels for most subscales. Others have done similar studies on CRS, using a variety of validated outcomes tools[7-11].

Disease-specific QOL instruments have also been developed in most areas of the specialty, including the voice[12-14], hearing loss and otology[15-21], head and neck cancer[22-25], rhinology and allergy[26-29] and pediatric sinusitis[30], otitis media[31] and tonsil and adenoid disease[32-34].

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Some early publications assisted clinicians in the use of outcomes-based tools and summarized the current status of instrument development[35,36]. Later publications have provided tutorials on how to do outcomes research, and have also reviewed the findings in particular subspecialty areas[37-40]. Also, there have been regular instructional courses and miniseminar presentations on outcomes assessment at the annual meetings of the American Academy of Otolaryngology - Head & Neck Surgery, as well as other specialty society meetings.

OUTCOMES IN CHRONIC RHINOSINUSITIS

In 2004, the American Academy of Otolaryngology - Head & Neck Surgery commissioned several groups to review the best evidence in several areas, including CRS. The CRS group was led by Dr. Tim Smith, and their findings were published in the American Journal of Rhinology[41]. The group did a systematic review of studies which addressed this question: in adults with CRS who have failed medical management, does endoscopic sinus surgery (ESS) improve symptoms and/or QOL? To be included, the study had to use a validated instrument to measure either global or disease-specific QOL. Their literature search identified 886 potential articles, but only 45 actually met their criteria of patients who failed medical management, and using a validated outcomes tool in adults. Of those, there were 42 articles which were level 4 evidence (case series with or without comparison), and one article which was level 2 evidence (prospective observational cohort study). These articles all consistently found that ESS did improve symptoms and QOL, however there were no control groups or comparisons. The authors' concluding statement was: "There is substantial level 4 evidence with supporting level 2 evidence that ESS is effective in improving symptoms and/or QOL in adult patients with CRS."

This finding is consistent with the experience of sinus surgeons: patients do tend to have significant improvement in quality of life and functional status after ESS. However, unfortunately during the development of ESS there were really no randomized trials performed comparing surgery with, say, extensive medical therapy. Recently, there have been two studies which have attempted to address this gap.

Dr. Valerie Lund's group[42] performed a prospective randomized controlled trial comparing endoscopic sinus surgery with an extensive medical treatment regimen. Outcomes were assessed using a validated disease-specific QOL instrument (the SNOT-20), a validated global QOL instrument (the SF-36), and nasal endoscopy. The medical group received 12 weeks of erythromycin, nasal steroid spray and nasal irrigation. The surgical group also received two weeks of erythromycin, and 12 weeks of nasal steroid spray and nasal irrigation. The authors found at 6 months and one year post-enrollment no difference in QOL or endoscopic outcomes between the surgical and medical treatment groups. This was a surprising finding to many, and this important study demonstrates the need for more comparative trials. However, there are some criticisms of the study: it was a fairly small series, the medical treatment regimen was more aggressive that typically used, and patients were not first treated with a medical course, then offered surgery or randomization - which would be more consistent with usual treatment protocols.

Dr. Timothy Smith led a prospective multispecialty study[43] to compare outcomes between medical and surgical treatment for CRS. They did not perform randomization as they were concerned that patients would not agree to enroll if they were forced to be randomized, so that is a potential criticism of the study design. Nevertheless, they had a standardized protocol of three weeks of antibiotics and nasal steroids, and if patients were still symptomatic they were offered either ESS or continued medical therapy. This might introduce selection bias, but if so the bias would likely be that the more severely affected group would choose surgery, thus biasing the surgical group to worse outcomes. The findings, however, were that the surgical group had statistically significantly larger improvement in QOL, with lower use of antibiotics, systemic steroids, and less missed school and work, compared to the medical treatment group.

Clearly more studies are needed to directly compare medical treatment regimens and surgical treatment. What is also missing from the discussion is a severity staging system for CRS. It would be most helpful if we could identify those patients with mild disease (most likely to respond to simple medical treatment) and severe disease (which will need surgery and perhaps extensive prolonged medical treatment), with those two prognostic groups undergoing standardized treatment. Then, we could perform comparative studies on patients with moderate disease - to see which protocols are most effective.

SUBJECTIVE VS. OBJECTIVE OUTCOMES ASSESSMENT

The gold standard for assessing the anatomic severity of CRS is the computed tomography (CT) scan. This is an objective measure of mucosal thickening, sinus obstruction, polyposis, and retained/obstructed secretions. There are several widely-used staging systems for sinus CT scans, all with good distribution of severity and good inter-rater and intra-rater reliability[44].

As we have been able to measure subjective outcomes - such as QOL - one very interesting finding has been the fact that the computed tomography (CT) scan and nasal endoscopic findings are not associated with the patient's disease-specific QOL[45]. This was a very surprising finding at first; it would stand to reason that patients with more mucosal dis-

ease, and more sinuses affected, would have more significant symptoms and QOL impact from the disease. However, we now understand this is not the case. The history of these findings is as follows.

The first study to demonstrate this was from Dr. Jay Piccirillo at Washington University in St Louis[46]; they found a very weak correlation coefficient between patient-based QOL and CT stage, as well as a non-significant p-value. Stewart et al. re-analyzed the Bhattacharyya data and added another prospective dataset from their own institution[47]. The authors used different instruments, and multiple types of statistical techniques, including analysis by worst side and by individual sinus, and were still unable to demonstrate any significant associations between CT findings and patient-based subjective outcomes. Other authors have also studied this, using different patient populations, and different outcome assessment tools and CT staging systems, and all have consistently found that the CT stage is not associated with disease-specific QOL[48-50].

Not surprisingly, it has been shown that the CT scan stage does correlate well with nasal endoscopic findings - especially after ESS[51,52]. This is not surprising because both endoscopy and CT scan are assessing mucosal disease and the presence or absence of secretions. So, nasal endoscopic findings are a good measure of what the CT scan would show, without any radiation exposure.

This finding of a difference between what an objective test shows and what the patient subjectively feels is not unique to CRS[45]; it has been shown in many other conditions. For example, the audiogram does not entirely predict the patient's perceived hearing handicap, lung function studies do not fully predict the patient's perception of breathing difficulty, and in patients with back pain, radiologic studies do not predict the severity of symptoms.

Therefore, while objective measures such as the CT scan are important, there are other aspects of disease impact which must be measured in other ways, such as validated outcome tools. These outcome measures are complementary - each measuring an important aspect of disease that is related but independent.

PREDICTING OUTCOMES

While the CT scan and other objective measures may not predict the subjective findings at baseline, could they predict the outcome after treatment? This is a different question, which has also been explored. In fact, there is evidence that the CT scan severity is a predictor of symptom-based outcome. That study[53] found that CT stage was an independent predictor of disease-specific QOL. In other words, patients with more mucosal disease on CT scan have larger improvement in subjective symptoms after ESS than patients with less mucosal disease. This might seem counter-intuitive, that patients with more mucosal disease had greater improvement (you might expect them to do worse). But in fact, it is probably because there is more room for improvement once their inflammatory/obstructive status is improved with surgery.

This finding that CT scan is an independent predictor of QOL improvement has been confirmed in another large prospective study as well[52]. In that study, several other factors that might predict outcome were evaluated prospectively. Patients who were candidates for surgery were carefully studied at entry and multiple variables including demographics, polyposis, asthma, aspirin intolerance, allergy, prior surgery, smoking, depression etc., were systematically assessed. There were two primary outcomes assessed prospectively in the study: disease-specific QOL (objective) and Lund-Kennedy nasal endoscopy score (subjective), and patients showed large improvement in both QOL and endoscopy scores after ESS. The factors which were independent predictors of better endoscopic outcome were: worse pre-op endoscopy score, no aspirin intolerance, and worse pre-op CT stage. Factors predictive of better QOL outcome (probably most important to the patient AND physician) were: lack of depression, no aspirin intolerance, worse pre-op CT stage, and worse pre-op QOL. Other factors, such as polyposis and allergy, were surprisingly not independent predictors of outcome.

CONCLUSIONS

In summary, outcomes assessment in CRS is evolving. We have new tools and techniques to systematically assess outcomes - both objective and subjective - using standardized classification schemes and validated instruments. We know that both subjective and objective outcomes are important, and that they are not measuring the same underlying construct. We also know that ESS is effective in improving subjective and objective outcomes in appropriately selected patients with CRS. Finally, we are making progress in identifying the factors which will better enable us to advise our patients about expected outcomes with different types of treatment.

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