# Quality-of-life assessment after endoscopic skull base surgeries

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**Introduction**
Endoscopic transnasal approaches have been the main treatment option for most of anterior skull base and sellar diseases. Quality-of-life (QOL) assessment after skull base surgeries are now well appreciated and measured to improve medical and surgical care for those patients.

**Aim**
To assess QOL after endoscopic transnasal skull base surgery in its six main domains.

**Patients and methods**
This study was conducted on 20 patients who had endoscopic skull base surgery for various skull base lesions. QOL was assessed by modified short form health survey questionnaire 1 and 4 weeks postoperatively. A scoring system was adopted, and cases were divided into two group according to their overall score (worse and better groups). Comparison between the two groups was conducted to determine factors that worsen QOL results after endoscopic skull base surgery.

**Results**
The overall QOL showed statistical improvement 1 month postoperatively over after 1 week. One week after operation, QOL was statistically affected by age of patient, duration of nasal pack removal, and duration of ICU admission. Postoperative pain domain is worsened by superior turbinate resection or trimming during first week.

**Conclusion**
QOL after endoscopic skull base surgeries has been associated with statistically significant improvement after 4 weeks, with significant decrease in the incidence of postoperative complications.

**Keyword:**
endonasal, quality of life, skull base

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## Introduction

Endonasal approach provides the most direct route to the skull base. The introduction of transnasal endoscopic skull base surgery allowed management of a wide variety of skull base lesions with minimal morbidity and mortality with equivalent rates of gross total tumor resection [1,2].

It provides better visualization to the tumor as well as the surrounding neurovascular structure, which improves surgical outcomes and minimizes complication incidence, but with more sinonasal corridor morbidity [1,3,4].

This approach has high incidence of postoperative cerebrospinal fluid (CSF) leakage (4–38%), which is much reduced by the introduction of the vascularized nasoseptal flap [5,6].

Although quality of life (QOL) is an accepted concept in the setting of health care, it is not well defined or measured frequently in skull base surgery. The QOL in patients with cranial base tumors is influenced by several factors, related to nature of the disease, the modality of treatment, and reconstruction methods [7].

It is obvious there is a continuous need for new and modified surgical approaches to the skull base that reduce morbidity and improve the QOL [8].

Various QOL outcome instruments are available for assessing skull base surgery, focusing on six main domains: role of performance, physical functioning, vitality, effect on emotion, pain, and nose-specific symptoms [8].

A commonly used instrument with experience in otolaryngological and neurosurgical conditions is the validated 36-item short form health survey questionnaire (SF-36) [9].

There are few studies specifically addressing QOL in patients who have undergone anterior skull base surgery [8–10].

Early studies of QOL following open craniofacial resection showed that up to 89% had some complaints, particularly regarding cosmoses, and 63% of patients were dissatisfied with their physical functions and their emotional well-being following surgery [10].

Fliss *et al.* 2007[8] reported in a cohort study of QOL after open skull base surgery that 50% of patients had QOL below 50 which is translated as (considerable suffering), while 45% of cases could return to their work Despite this suffering, all patients stated that they would again agree to surgery if back time.

## Aim

The aim was to assess QOL after endoscopic transnasal skull base surgery in six main domains.

## Patients and methods

This is a prospective analytical study. It included 20 patients with skull base lesions (tumors or defect) who were candidates for endoscopic skull base surgery.

We excluded children under 9 years old, postoperative mortality cases within 3 months, patients with disturbed conscious level, and malignant skull base tumors.

Ethical committee approval of Otorhinolaryngology, Head and Neck Surgery Department, at our institute was granted before embarking on the study. Informed consents were retrieved from all participants of this study.

A definitive protocol for evaluation was followed preoperatively in all patients, including detailed history taking, full otorhinolaryngology, neurological, ophthalmological, endocrinological radiological assessment, and endoscopic examination.

All operative details, steps, and events were recorded and reported, including approach used, operation time, and intraoperative complications. Postoperative care was offered according to each case need.

All postoperative adverse effects, eventual residual, and need for adjuvant radiation therapy, postoperative complications (e.g. CSF leak, pneumocephalus, neurovascular injury, hemorrhage, and endocrinal complications) were monitored and reported.

Moreover, date of pack removal, ICU admission, hospital admission, conscious level, and QOL score were also reviewed and statistically analyzed.

Postoperative QOL was assessed by modified SF-36, which is formed of 17 questions. Each question was designed to test whether the patient felt good or bad or no change after operation. Those questions are designed to evaluate main six domains of QOL: general performance of the body, the physical functions of the body organs, vitality and sexual health, postoperative pain, nasal and eye symptoms, and effect on emotions.

This questionnaire was translated into Arabic and printed to be easily fulfilled by the patient (Fig 1).

All patients were requested to complete two skull base questionnaires, after 1 week and after 1 month postoperatively.

Scoring test in each item was as follows: if the patient felt good, grade 3 was given, if the patient felt bad grade 1 was given, but if no change postoperatively, then grade 2 was given. Best score was supposed to be 51 and the worst score 17 (Table 1).

Patients were divided into two groups according to their scores. Group A (better group) included patients who achieved QOL score from 35 to 51 and group B (worse group) included patients who achieved QOL score from 17 to 34.

**Table 1 Summary of domain questions in the skull base quality of life questionnaire (better=3, same=2, worse=1 with best score=51, worst score=17)**

| | Worse (1) | Same (2) | Better (3) |
|---|---|---|---|
| Role of performance | | | |
| General performance and participation in social activities | | | |
| Communication with people | | | |
| Physical functioning | | | |
| Preferring to stay in bed | | | |
| Carrying out routine activities | | | |
| Vitality | | | |
| Feeling weakness | | | |
| Relationships with spouse | | | |
| Pain | | | |
| Experiencing pain | | | |
| Effect of pain on activity | | | |
| Use of pain killers | | | |
| Specific symptoms | | | |
| Change in appetite | | | |
| Altered sense of smell | | | |
| Nasal secretions | | | |
| Nasal crustations | | | |
| Nasal obstruction | | | |
| Effect of surgery on vision | | | |
| Impact on emotions | | | |
| Feeling tense | | | |
| Problems falling asleep | | | |

## Results

This study was conducted on 20 patients. Their age ranged from 20 to 61 years, with a mean age of 39.20 years. Eleven (55%) patients were males, and nine (45%) patients were females.

A total of 14 (70%) cases had pituitary adenomas: two (10%) cases had craniopharyngioma and four (20%) cases had CSF leakage.

The overall mean QOL score was 34.00 out of 51 after 1 week and 42.90 after 1 month. There was a highly statistically significant difference between QOL after 1 week and 1 month ($P < 0.001$) (Table 2).

Mean values of each domain of QOL questionnaire after 1 week and 1 month postoperatively are demonstrated in Table 2.

On comparison between each domain, a statistically significant difference was found in pain domain, physical function domain, specific nasal symptom domain, and effect on emotion domain, with $P$ value less than 0.05. Moreover, a highly significant difference was found in the vitality domain ($P < 0.001$). Yet, there was no statistically significant difference in the role of performance domain (Table 2).

Figure 1

Summary of domain questions in the skull base quality of life questionnaire

| استبيان جوده الحياه بعد جراحات قاع الجمجمه بالمنظار | نعم(1) | كما هو(2) | لا(3) |
|---|---|---|---|
| هل هناك تأثير على الأداء العام و المشاركة في الأنشطة الاجتماعية بعد العمليه | | | |
| هل هناك تأثير على التواصل مع الاخرون بعد العمليه | | | |
| هل هناك رغبه فى البقاء فى السرير بعد العمليه | | | |
| هل القيام بالأنشطه الروتينيه اليوميه تأثر بعد العمليه | | | |
| هل هناك شعور بأى ضعف جسدى بعد العمليه | | | |
| هل هناك أى تأثير على العلاقه الزوجيه بعد العمليه | | | |
| هل هناك شعور بأى ألم بعد العمليه | | | |
| هل هناك تأثير لهذا الألم على الانشطه اليوميه | | | |
| هل تستخدم مسكنات الألم بعد العمليه بصوره متكرره | | | |
| هل هناك تغيير فى الشهيه بعد العمليه | | | |
| هل هناك تغيير فى حاسه الشم بعد العمليه | | | |
| هل هناك أى افرازات من الأنف بعد العمليه | | | |
| هل هناك شعور بأى قشور داخل الأنف بعد العمليه | | | |
| هل هناك شعور بانسداد الأنف بعد العمليه | | | |
| هل هناك أى تأثير على الرؤيه بعد اجراء العمليه | | | |
| هل هناك أى شعور بالتوتر بعد العمليه | | | |
| هل يوجد اى اضطرابات فى النوم بعد العمليه | | | |

Arabic model of skull base quality of life questionnaire.

Patients were divided into two groups according to the median score (34).

Group B (worse group) achieved scores from 17 to 34 and group A (better group) achieved scores from 35 to 51.

After 1 week, 10 patients achieved score more than 34 (50%) and included in group A and group B included 10 (50%) patients with score less than 34. However, after 1 month, all patients (20 patients, 100%) achieved scores above mean score.

One week postoperatively, group B included 10 patients, comprising seven (70%) males and three (30%) females, whereas group A included 10 patients, comprising four (40%) males and six (60%) females. The mean age of the patients included in group B was 49.30 years, whereas that of patients of group A was younger 29.10 years, which was statistically significant (Table 3).

Eight (40%) patients of our study had temporal field loss: six (75.0%) patients in group B and two (25.0%) patients in group A. This relation was statistically not significant.

A total of 13 (65%) patients of our study had loss of visual acuity: seven (53.8%) patients in group B, whereas six (46.2%) patients in group A. This relation was statistically not significant also. A total of 11 (55%) patients of our study had preoperative hormonal disturbance: five (45.5%) patients were in group B, whereas six (54.5%) patients were in group A. This relation was statistically not significant.

The mean duration of the presenting symptoms in group B was 6.90 months, whereas that of group A was 14.80. This relation was statistically not significant.

Regarding the type of lesion, nine (90%) cases of group A had pituitary adenoma and one (10%) case had spontaneous CSF leak, whereas five (50%) patients of group B had pituitary adenoma, three (30%) patients had spontaneous CSF leak, and two (20%) patients had craniopharyngioma.

**Table 2 Comparison between mean quality-of-life score after 1 week, 1 month**

| Mean QOL value 1 week | | Mean QOL after 1 month | *P* |
|---|---|---|---|
| Role of performance (out of 6) | 5.90 | 5.90 | 1 |
| Physical functioning (out of 6) | 4.10 | 5.40 | 0.006 |
| Vitality (out of 6) | 2.85 | 4.80 | <0.001 |
| Pain (out of 9) | 5.15 | 7.10 | 0.001 |
| Specific nasal symptoms (out of 18) | 12.10 | 14.85 | 0.001 |
| Impact on emotion (out of 6) | 4.40 | 5 | 0.034 |
| Overall | 34 | 42.9 | <0.001 |

QOL, quality-of-life.

Middle turbinate remained intact in all patients (100%) of group B, whereas it was cauterized in one (10%) patient, and it remained intact in nine (90.0%) patients of group A. This relation was statistically insignificant. Superior turbinate remained intact in seven (70%) patients, trimmed in two (20.0%) patients, and resected in one (10.0%) patient of group B, whereas it remained intact in six (60%) patients, trimmed in three (30%) patients, and resected in one (10.0%) patient of group A. This relation was statistically insignificant.

Five (50%) cases of group B had intraoperative CSF leak, whereas four (40%) cases of group A had intraoperative CSF leak, which was statistically insignificant.

Mean operative time of group B was 4.60 h, whereas mean operative time of group A was 3.70.

Mean duration of postoperative pack removal in group B was 3.60 days, whereas mean duration of pack removal in group A was 2.80 days. It was significant ($P < 0.05$) (Fig 2).

The mean duration of the postoperative ICU in group B was 1.50 days, whereas the mean duration of the postoperative ICU in group A was 0.50 day. This relation was significant ($P < 0.05$) (Fig 3).

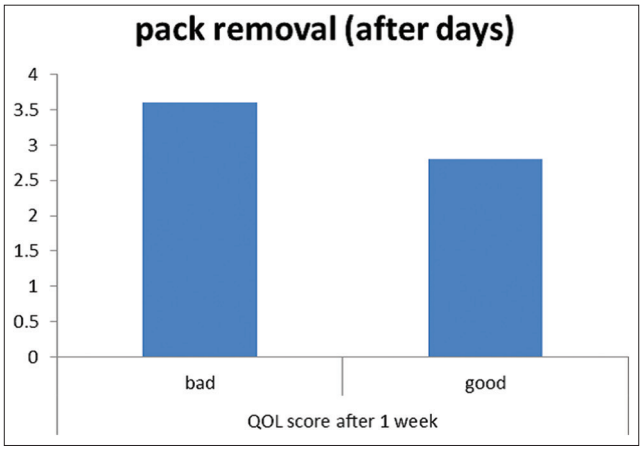
Statistical comparison was made between both patients groups with respect to each domain.

**Table 3 Comparison between age distributions of both groups**

| | QOL score after 1 week | | | | |
|---|---|---|---|---|---|
| | Worse group (B) | | Better group (A) | | *P* |
| | Count | % | Count | % | |
| Male | 7 | 70.0 | 4 | 40.0 | 0.37 |
| Female | 3 | 30.0 | 6 | 60.0 | |
| Mean age (years) | 49 | 29.1 | 0.003 | | |

QOL, quality-of-life.

**Figure 2**




Mean duration of pack removal in both groups (statistically significant).

Concerning the physical function domain, the mean age of those with worse score (group B) in this domain was 49.25 years, whereas the mean age of those with the better score (group A) was 33.77 years. The age factor significantly affected the physical function domain ($P < 0.05$). The mean duration of pack removal in group B of this domain was 3.86 days, whereas the mean duration of pack removal in group A was 2.85 days. The mean ICU duration of group B in the same domain was 1.86 days, whereas the mean ICU duration of group A was 0.54 day, which was statistically significant, a fact that means that physical function domain was worsened by older age of patient, duration of pack removal, and ICU admission.

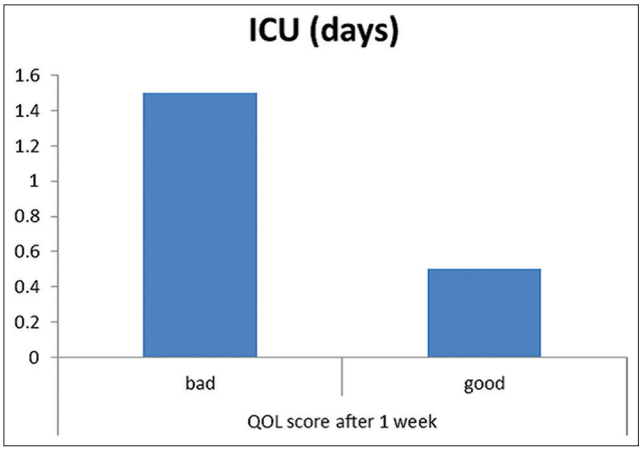
Concerning the pain domain, superior turbinate remained intact in 11 (78.6%) cases of group A. In group B, it remained intact in two (33.3%) cases only. The relation between pain domain and dealing with superior turbinate was significant, as *P* value less than 0.05, a fact that means that postoperative pain was worsened by superior turbinate resection or trimming.

## Discussion

In recent years, several studies explored the role of endonasal endoscopic approaches to anterior skull base pathology. These approaches reach the pathology before critical nerves and vessels, which in theory should minimize the risk of damage during dissection [10,11].

Early data on sinonasal morbidity and QOL following the endonasal approach to the skull base suggest that there may be a greater sinonasal anatomy morbidity higher compared with standard external approaches. However, this appears to be temporary [8].

**Figure 3**




Mean duration of ICU admission in both groups (statistically significant).

The QOL results of endoscopic endonasal skull base approaches are encouraging, showing that the overall QOL is very good and that this is achieved early in the postoperative period compared with external approaches [8].

The QOL today is the strongest tool for assessing the response to treatment [10].

The best instruments to measure QOL should have the following characteristics:
(1) Reliable, with reproducible and consistent results under constant conditions.
(2) Valid, covering the full range of topics relevant to the condition and consistent with established measures.
(3) Responsive and sensitive in detecting change [12].

This study included 20 patients. A total of 14 cases had pituitary adenoma, two cases had craniopharyngioma, and four cases had spontaneous CSF leak.

QOL was assessed by modified sinonasal outcome test (SNOT)-22 questionnaire 1 and 4 weeks postoperatively. The overall QOL scores had a statistically significant improvement 1 month over the first week postoperatively.

In this study, the difference in vitality domain after 1 week and 1 month postoperatively was highly statistically significant. However, the role of performance domain did not seem to improve 1 month postoperatively.

In agreement with our results, Harshita *et al.* (2010), examined the QOL outcomes using the anterior skull base questionnaire and the SNOT-22 questionnaire in 51 patients who had endonasal approach for a variety of skull base lesions. Their results showed a temporary increase in sinonasal morbidity, which marked improvement in overall QOL after 4–6 months. They referred this improvement to the resolution of physiologic scores and continued improvement in emotional well-being [13].

Moreover, Hopkins [3], described a significant improvement in SNOT scores and QOL at 3 months ($P$ = 0.03) rather than 1 month in a study on 39 patients with pituitary adenoma. They found marked improvement in emotional well-being parameters (e.g. sadness, frustration, concentration, productivity, and fatigue) and temporary physiologic parameter changes (e.g. olfaction, obstruction, and postnasal drainage) after surgery ($P$ < 0.05) [3].

In 2015, Little *et al.*[14] compared short-term and long-term postoperative SF-36 scores for patients with pituitary adenomas undergoing endoscopic pituitary surgery, and concluded that outcome scores are worse in the short-term postoperatively (<2 weeks), but recover to baseline by 3 months. They reviewed that all domains improved to baseline population levels after 2 weeks postoperatively with the exception of the physical role functioning domain, which took a little bit more time [14].

In this study; patients were divided into two groups after 2 weeks: group A (better group) included 10 cases with QOL scores from 35 to 51, where nine cases had pituitary adenoma, and one case had spontaneous CSF leak. Group B (worse group) included 10 cases with QOL score from 17 to 34 (less than the mean score), where five cases had pituitary adenoma, three cases had spontaneous CSF leak, and two cases had craniopharyngioma.

In our study, older patients achieved low QOL scores. The QOL in group B (mean 49 years) is significantly affected by the advancement of age ($P$ = 0.003).

Nikolopoulos *et al.* [15], in their study on 69 patients who had anterior skull base tumor concluded that old age had a negative effect on health-related QOL. They explained that younger patients cope better with the anterior skull base neoplasms and surgery [15].

In this study, the mean time of postoperative pack removal was 3.60 days. The longer time of pack removal in the worse group significantly caused by intraoperative CSF leak and excessive hemorrhage ($P$ = 0.043).

Other studies did not use mean time of nasal pack removal as a factor affecting QOL assessment.

In our study, the mean duration of the postoperative ICU was 1.50 days in the worse group B. Longer time of ICU admission significantly affected QOL ($P$ = 0.029). Cases that needed ICU for longer duration were pituitary adenoma to control diabetes insipidus and craniopharyngioma to control intracranial hematoma and conscious level. McLachlan *et al.* [16], studied 69 patients who had anterior skull base tumors. They reviewed that old age, malignancy, comorbidity, radiotherapy, and wide surgery were found to be negative prognostic factor for QOL measures [16].

In addition, Gil *et al.*[17] found improvement in the overall QOL score 6–24 months after surgery in studying 40 patients underwent resection of anterior skull base tumors.

In our study, physical function domain score was significantly affected by age group, pack removal, and

ICU admission, whereas pain domain was significantly affected by dealing with superior turbinate ($P = 0.029$). Other domains of QOL were not significantly affected by those variables.

Gil *et al*.[17] found older age resulted in lower scores in physical function domain. Moreover, malignant tumors significantly affected performance, physical function, specific nasal symptoms, and emotion domains, whereas radiation significantly decreases score of specific symptoms and emotion domains [17].

The overall incidence of complication was 60%, including CSF leak (5%), minor hemorrhage (25%), and transient diabetes insipidus (30%). None of the cases developed major central nervous system and systemic complication. All patients presented good outcome after ICU admission [17].

## Conclusion

Endoscopic skull base surgeries have been associated with statistically significant improvements on disease-specific QOL after 4 weeks with significant decrease in the incidence of postoperative complications.

Postoperative QOL is significantly affected by age of patient, duration of nasal pack removal, and duration of ICU admission. Postoperative pain domain is worsened by superior turbinate resection or trimming during first week.

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### Conflicts of interest

There are no conflicts of interest.

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