



Preoperative and Postoperative Factors Affecting Patient Satisfaction After Total Knee Arthroplasty

Total Diz Artroplastisi Sonrası Hasta Memnuniyetini Etkileyen Preoperatif ve Postoperatif Faktörler

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ABSTRACT

Aim: Our study aimed to evaluate patient satisfaction 12 weeks after total knee arthroplasty (TKA) and determine preoperative and postoperative factors which influence short term patient satisfaction following TKA.

Material and Method: Patients who underwent 40 primary TKAs were included. Patients were assessed by using Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC), Short Form-36 (SF36), Visual Analog Scale (VAS)-pain, 50-meter walking test preoperatively and 12 weeks after TKA. The duration of walking was measured while the patients walked 50 m. Both pre and postoperative flexion and extension range of motion (ROM) of the knee were recorded. Postoperatively patient satisfaction was evaluated.

Results: Preoperatively, there was no difference between satisfied and dissatisfied patients in terms of age, VAS-pain, SF36 sub scores, WOMAC sub scores, active and passive flexion and extension ROMs ($p>0.05$). Postoperatively, VAS-pain and SF36 general health and physical-emotional sub scores were lower and passive knee flexion was higher in satisfied patient group ($p<0.05$). Among clinical parameters, only postoperative VAS-pain had a significant negative impact on patient satisfaction ($p<0.05$). Other parameters including age, gender, pre and postoperative active flexion and extension ROMs, preoperative VAS-pain, WOMAC and 50-metre walking duration had no impact on patient satisfaction ($p>0.05$).

Conclusion: Preoperative pain, disability and quality of life had no effect on postoperative short term patient satisfaction. Postoperative pain severity, knee flexion ROM degree and deterioration in quality of life had significant negative impact on postoperative patient satisfaction. Larger studies are necessary to further clarify the factors associated with dissatisfaction following TKA.

Key words: arthroplasty; satisfaction; quality of life

ÖZET

Amaç: Bu çalışmada total diz artroplastisinden (TDA) 12 hafta sonra hasta memnuniyetinin değerlendirilmesi ve TDA sonrası kısa dönem hasta memnuniyetini etkileyen preoperatif ve postoperatif faktörlerin saptanması amaçlanmıştır.

Materyal ve Metot: Primer TDA yapılan 40 hasta çalışmaya alındı. Hastalar Western Ontario ve Mc Masters Üniversiteleri Osteoartrit İndeksi, Kısa Form-36 (SF36), Görsel Analog Skala (Visual Analog Scale, VAS)-ağrı, 50 metre yürüme testi ile ameliyat öncesi ve TDA'dan 12 hafta sonra değerlendirildi. Pre ve postoperatif diz fleksiyon ve ekstansiyon eklem hareket açıklıkları (EHA) kaydedildi. Postoperatif hasta memnuniyeti değerlendirildi.

Bulgular: Preoperatif dönemde gruplar arasında memnun ve memnun olmayan hastalar arasında yaş, VAS-ağrı, SF36 alt skorları, aktif ve pasif EHA'lar açısından fark yoktu ($p>0,05$). Postoperatif dönemde memnun hasta grubunda VAS-ağrı ve SF36 genel sağlık ve fiziksel-emosyonel rol alt skorları düşük, pasif diz fleksiyonu ise yüksekti ($p<0,05$). Klinik parametreler arasında sadece postoperatif VAS-ağrının hasta memnuniyeti üzerine belirgin negatif etkisi vardı ($p<0,05$). Yaş, cinsiyet, pre ve postoperatif aktif fleksiyon ve ekstansiyon EHA'ları, preoperatif VAS-ağrı, WOMAC ve 50 metre yürüme süresinin hasta memnuniyeti üzerine etkisi yoktu ($p>0,05$).

Sonuç: Preoperatif ağrı, disabilite ve yaşam kalitesinin postoperatif kısa dönem hasta memnuniyeti üzerine etkisi yoktu. Postoperatif dönemdeki ağrı şiddeti, diz fleksiyon EHA derecesi ve yaşam kalitesinde bozulmanın hasta memnuniyeti üzerine belirgin negatif etkisi mevcuttu. TDA sonrası memnuniyetsizlikle ilişkili faktörlerin geniş ölçüde netleştirilmesi için daha çok hasta içeren çalışmalara gereksinim vardır.

Anahtar kelimeler: artroplasti; memnuniyet; yaşam kalitesi

Introduction

Osteoarthritis (OA), also called degenerative joint disease, is the most common form of arthritis and one of the leading causes of physical disability¹. It is characterized by loss of articular cartilage, within synovial joints, associated with hypertrophy of bone and thickening of the capsule. It may occur in any joint, but is most common in the hand,

foot, knee, spine and hip². It disables about 10% of people who are older than 60 years. The economic burden of OA including direct costs of medical interventions and indirect costs of disability is high, accounting for more than \$60 billion per year in United States³.

The most commonly affected peripheral joints are the knees¹. Various factors including obesity, malalignment, trauma or joint instability have been found to be associated with knee OA⁴. Total knee arthroplasty (TKA) is one of the most effective surgical treatment options in relief of pain and improve functions for the patients who are not responsive to conservative therapy. The world's population aging has led to increase in the frequency of knee OA and consequently TKA for end stage-arthritis^{5,6}.

Patient satisfaction was first defined as the patient's 'attitudes toward physicians and medical treatment' by Hulka et al.⁷ in 1970. Patient satisfaction after TKA may be associated with patient's expectations and improvement in pain and other clinical symptoms and functions⁵. In previous studies in the literature, it was reported that there was discordance between patient and surgeon satisfaction after surgery^{8,9}. Unfortunately, 18–30% of the patients reported dissatisfaction with treatment outcomes after TKA¹⁰.

The present study aims to assess patient satisfaction in patients with knee OA at 12 weeks after TKA and to determine preoperative and postoperative factors associated with post-TKA patient satisfaction.

Material and Method

A total of 40 patients (36 women and 4 men) with knee osteoarthritis who underwent 40 primary TKAs were included in the study. All of the patients met American College of Rheumatology criteria for knee OA¹¹. Exclusion criteria were presence of neurological diseases such as multiple sclerosis, cerebrovascular disorders, Parkinson's and Alzheimer's diseases; uncontrolled comorbid diseases such as diabetes mellitus and hypertension. Data regarding age, gender, duration of symptoms were noted.

Functional status was evaluated by using Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC)¹². WOMAC is a patient-administered questionnaire which assesses pain, stiffness and functional disability due to osteoarthritis. It includes 24 items. High scores indicate worse pain, stiffness and functional status¹².

Short Form-36 (SF36)¹³ was used for assessing QoL. SF36 is a 36-item questionnaire which has eight dimensions including vitality, physical functioning, physical role functioning, bodily pain, general health, mental health and emotional and social functioning. Higher scores on SF36 indicate higher QoL.

Severity of pain on 100 mm Visual Analog Scale (VAS)¹⁴; pain, stiffness, function and total scores of WOMAC; SF36 scores and duration of walking were recorded at baseline (preoperative) and at 12 weeks after TKA. The duration of walking was measured while the patients walked 50 m. Both pre and postoperative ROMs of the knee were measured by using goniometry and flexion and extension degrees of the knee were recorded.

Surgery Procedure

Unilateral TKAs were performed to all of the patients by the same orthopedic surgeon. After combined epidural and spinal anesthesia, patients were prepared and draped in supine position for surgical incision. Knee joint was accessed via paramedian incision. Both tibial and femoral components were fixed with bone cement. No complication due to surgery was observed.

Patient satisfaction was evaluated by the answers to the question 'Are you satisfied?' Answer 'yes' was accepted as 'satisfaction', while answers 'no' and 'I am not sure' were accepted to be 'dissatisfaction'.

Postoperative Physiotherapy Program

Postoperatively, all of the patients underwent a physiotherapy program which involves quadriceps strengthening exercises, gluteal sets, ankle pumps, heel slides, hip abduction and knee flexion exercises which are done lying on back and repeated 20 times.

The present study conforms to the provisions of the World Medical Association's Declaration of Helsinki. The study protocol was approved by the Medical Research Ethics Committee. All of the participants signed informed consent form.

Data were presented by descriptive analysis with mean±standard deviation (SD) and median values. Scores of the above-mentioned scales were obtained for statistical analyses. Mann Whitney U test was used to compare the differences between two groups for continuous variables. Logistic regression analysis was used to determine factors affecting patient satisfaction. A value of $p < 0.05$ was considered statistically

significant. All analyses were performed using IBM Statistical Package for the Social Sciences (SPSS) for Windows, Version 21.0 (Armonk, New York, USA).

Results

The study included a total of 40 patients (36 women and 4 men) with knee osteoarthritis who underwent TKA. Of the patients, 82.5% (33 patients) was satisfied and 17.5% (7 patients) was dissatisfied. Mean age was 65.91 ± 7.79 [48–77] (median 66) in satisfied patient group and 67.57 ± 10.50 [50–80] (median 73) in dissatisfied patient group. According to Mann Whitney U test, preoperatively, there was no statistically significant difference among groups in terms of age, VAS-pain, SF36 sub scores, WOMAC sub scores, active and passive flexion and extension ROM degrees ($p > 0.05$) (Table 1).

Twelve weeks after TKA, VAS-pain and SF36 physical role, general health and role emotional sub scores were lower and passive knee flexion was higher in satisfied patient group than in dissatisfied patient group ($p < 0.05$). There was no statistically significant difference among groups in terms of SF36 physical function, bodily pain, vitality, social functioning and mental health sub scores, WOMAC sub scores, active flexion and extension ROM degrees ($p > 0.05$) (Table 2).

Impact of Clinical Parameters of the Patients

(Age, Gender, Pre and Postoperative Active and Passive Flexion and Extension ROMs, Pain, Stiffness and Functional Status) on Patient Satisfaction

Among clinical parameters, only postoperative VAS-pain had a significant impact on patient satisfaction ($p < 0.05$). Other clinical parameters including age, gender, pre and postoperative active and passive flexion and extension ROMs, preoperative VAS-pain, WOMAC and 50-metre walking duration had no impact on patient satisfaction ($p > 0.05$). β coefficients and adjusted R^2 values are given in Table 3.

Discussion

Patient satisfaction is increasingly being used to assess outcome of surgical intervention. This statement is also valid for TKA which is an elective surgical procedure which orthopedic surgeons perform for pain relief and functional recovery. Although TKA is thought to be the gold standard in the treatment of end stage knee osteoarthritis, in previous studies in

Table 1. Preoperative patient data

	Satisfied patient group (n=33)	Dissatisfied patient group (n=7)	p value
Age (years)	65.91±7.79 (66)	67.57±10.50 (73)	0.577
VAS-pain (mm)	90.63±12.73 (95)	96.85±4.74 (100)	0.218
Active knee flexion	87.88±14.69 (85)	84.71±9.09 (85)	0.702
Passive knee flexion	92.57±15.05 (90)	89.00±8.78 (90)	0.553
Knee extension	-2.12±4.15 (0)	-0.7±1.88 (0)	0.577
50-meter walking duration	36.06±8.51 (34.8)	32.02±3.55 (33.08)	0.293
WOMAC pain	13.78±3.38 (13)	13.42±2.44 (15)	0.626
WOMAC stiffness	5.21±1.21 (6)	5.71±0.75 (6)	0.421
WOMAC function	43.61±10.17 (45)	47.71±4.03 (47)	0.577
WOMAC total	62.60±13.42 (65)	66.86±6.15 (67)	0.781
SF36-physical function	19.09±13.13 (15)	17.14±9.06 (15)	0.807
SF36-physical role	6.06±21.69 (0)	0.00±0.00 (0)	0.728
SF36-bodily pain	19.84±17.48 (20)	9.42±11.76 (0)	0.205
SF36-general health	61.78±15.39 (62)	53.42±18.95 (60)	0.293
SF36-vitality	47.12±15.26 (50)	45.00±18.71 (45)	0.917
SF36-social functioning	49.62±64.76 (37.5)	21.42±17.25 (12.5)	0.081
SF36-emotional role	10.10±29.44 (0)	14.27±17.79 (0)	0.277
SF36-mental	54.54±14.51 (56)	54.86±19.69 (52)	0.781

Values are demonstrated as mean±SD (median). VAS-pain: Visual analog scale-pain, WOMAC: Western Ontario and McMasters Universities Index of Osteoarthritis, SF36: Short form-36, SD: Standard deviation, $p < 0.05$ (significant)

Table 2. Postoperative patient data

	Satisfied patient group (n=33)	Dissatisfied patient group (n=7)	p value
VAS-pain (mm)	11.21±6.49 (10)	17.14±4.87 (20)	0.044*
Active knee flexion	103.33±10.87 (100)	96.42±3.77 (95)	0.119
Passive knee flexion	108.18±10.73 (110)	99.28±5.34 (95)	0.02*
Knee extension	0.00±0.00 (0)	-1.36±2.58 (0)	0.152
50-meter walking duration	36.00±8.98 (34)	32.46±9.03 (30.8)	0.158
WOMAC pain	3.81±2.20 (5)	4.14±3.07 (5)	0.626
WOMAC stiffness	0.91±1.01 (0)	1.14±0.89 (1)	0.601
WOMAC function	12.55±7.62 (11)	16.00±10.45 (22)	0.246
WOMAC total	17.28±10.13 (16)	21.28±14.26 (28)	0.344
SF36-physical function	49.09±18.17 (55)	37.85±26.59 (50)	0.261
SF36-physical role	84.09±31.75 (100)	42.85±53.45 (0)	0.009**
SF36-bodily pain	72.91±6.56 (74)	57.14±22.53 (42)	0.218
SF36-general health	76.45±9.72 (77)	60.14±15.25 (60)	0.001**
SF36-vitality	61.97±13.11 (60)	57.14±16.55 (45)	0.261
SF36-social functioning	70.07±12.07 (75)	62.50±14.99 (37.5)	0.088
SF36-emotional role	88.89±29.65 (100)	42.85±53.45 (0)	0.003**
SF36-mental	64.84±11.94 (64)	62.28±12.82 (56)	0.626

Values are demonstrated as mean±SD (median). VAS-pain: Visual analog scale-pain, WOMAC: Western Ontario and McMasters Universities Index of Osteoarthritis, SF36: Short form-36, SD: Standard deviation, * $p < 0.05$ (significant), ** $p < 0.01$ (significant)

Table 3. Clinical variables of patients that may affect patient satisfaction

Variables	Patient satisfaction (Adjusted R ² : -0.119)	
	β	p value
Age	0.005	0.560
Gender	0.016	0.960
Preoperative VAS-pain (mm)	0.004	0.671
Postoperative VAS-pain (mm)	-0.135	0.049*
Active knee flexion (preop)	0.024	0.204
Passive knee flexion (preop)	-0.018	0.323
Knee extension (preop)	-0.068	0.803
Active knee flexion (postop)	0.011	0.500
Passive knee flexion (postop)	-0.023	0.162
Knee extension (postop)	-0.003	0.931
WOMAC pain (preop)	-0.030	0.476
WOMAC stiffness (preop)	0.027	0.783
WOMAC function (preop)	0.021	0.147
WOMAC pain (postop)	0.006	0.948
WOMAC stiffness (postop)	0.011	0.924
WOMAC function (postop)	0.006	0.794
50-meter walking duration (preop)	-0.014	0.302
50-meter walking duration (postop)	-0.007	0.550

VAS: Visual analog scale.

WOMAC: Western Ontario and McMaster Universities Index of Osteoarthritis, *p<0.05 (significant)

the literature, % 15–20 of the patients report dissatisfaction with surgery outcomes¹⁵. In our study, 17.5% of the patients were dissatisfied with short term outcomes of TKA. Our rates were comparable with ones reported in previous studies. Bourne et al.¹⁵ reported the rate of patient dissatisfaction after TKA as 19% in the study where 1703 patients were assessed. In a study from Kentucky, where 768 patients who underwent TKA were assessed, 10.4% of the patients were dissatisfied with 2-years outcomes of surgery¹⁶. Based on Swedish Knee Arthroplasty Registry, it was reported that 17% of the patients were dissatisfied with TKA procedure¹⁷. On the other hand, Du et al.¹⁸ reported the rate of patient dissatisfaction with outcomes of TKA as 13% in their study involving 748 Chinese patients.

The effect of age on patient satisfaction after TKA is still a matter of debate. In the present study, we found that postoperative patient satisfaction was not affected by age. Similarly, Jacobs et al.¹⁶ suggested that age was not associated with patient satisfaction after TKA. In contrast, Noble et al.¹⁹ demonstrated that patients younger than 60 years were more satisfied with outcomes of

TKA than older ones in their study conducted in 253 American patients. On the other hand, in the study of Williams et al.²⁰, patients younger than 55 years reported lower satisfaction with surgery outcomes than older ones. Based on cumulative data on the impact of age on patient satisfaction after TKA, age does not seem to be predictive of surgery outcomes. Biological age, rather than chronological age is likely to have a major role in functional recovery after TKA⁵.

In the present study, there was no effect of gender difference on patient satisfaction with outcomes of TKA. This finding was confirmed by Jacobs et al.¹⁶ who reported that gender was not associated with patient satisfaction after TKA. On the other hand, Singh et al.²¹ reported that female gender predicts greater risk of moderate to severe pain after TKA.

The current literature provides contradictory findings about the relationship between severity of arthropathy and patient satisfaction with outcomes of TKA. In the present study, it was found that pain severity was lower in satisfied patients than in dissatisfied ones 12 weeks after TKA. Additionally, postoperative pain had a significant impact on patient satisfaction. Similar to our findings, in a cross-sectional study conducted in the province of Ontario, lower postoperative patient satisfaction was reported in the patients with severe pain¹⁵. Also Jacobs et al.¹⁶ reported postoperative higher Knee Society Pain Scores related with patient dissatisfaction. In the present study, we did not find any association between patient satisfaction and functional status which was assessed by using both WOMAC and 50-metre walking duration. Similarly, Noble et al.¹⁹ suggested that satisfaction with TKR is not determined by functional level which was evaluated by using Knee Function Score. They suggested that patient satisfaction reflects each patient's subjective perception of their knee function rather than the biomechanical performance of their knee. In contrast, Kim et al.²² demonstrated that poor WOMAC scores were associated with low level of satisfaction in a study from Korea, in which 439 TKAs were evaluated. On the other hand, in a study from Singapore²³ a significant correlation was reported between patient satisfaction and WOMAC scores in 110 Asian patients following TKA. In the present study, we found that passive knee flexion was higher in satisfied patient group than in dissatisfied patient group; however multiple regression analysis revealed no impact of active-passive flexion or extension ROMs had no impact on patient satisfaction.

Similarly, Jacobs et al.¹⁶ reported lower passive flexion ROMs in dissatisfied patients than in satisfied ones.

The present study also evaluated the relationship between QoL and patient satisfaction. Preoperative SF36 scores did not differ between satisfied and dissatisfied patients; however postoperative SF36 general health, physical and emotional role sub scores were found to be lower (less degradation in QoL) in satisfied patient group than in dissatisfied patient group. In the study of Maratt et al.²⁴ patients with greater degradation in QoL were more likely to be dissatisfied after TKA. Association between QoL and patient satisfaction may be explained by personality traits. In the study of Gong and Dong²⁵ in which the relationship between outcomes of TKA and patient's personality trait, it was reported that patients with extroverted personality were more satisfied than those with introverted or anxious personality.

There are several limitations in our study. First one was small number of patients. Secondly, we did not evaluate impact of body mass index and quadriceps muscle strength on patient satisfaction. And thirdly, assessment of patient expectation before surgery and patient personality trait which may affect patient satisfaction is lacking.

In conclusion, preoperative pain, disability and quality of life had no impact on postoperative short term patient satisfaction. Patients with greater postoperative pain, lower knee flexion ROMs and more deterioration in QoL were less likely to be satisfied with surgery outcomes of TKA. Larger and further studies are needed to identify preoperative factors which may be predictive of patient satisfaction following TKA.

References

1. Neogi T. The epidemiology and impact of pain in osteoarthritis. *Osteoarthr Cartil* 2013;21:1145–53.
2. Woolf AD, Pfleger B. Burden of major musculoskeletal conditions. *Bull World Health Organization* 2003;81:646–56.
3. Buckwalter JA, Saltzman C, Brown T. The impact of osteoarthritis: implications for research. *Clinical Orthopaed Relat Res* 2004;427:6–15.
4. Guilak F. Biomechanical factors in osteoarthritis. *Best Pract Res ClinRheumatol* 2011;25:815–23.
5. Choi YJ, Ra HJ. Patient Satisfaction after Total Knee Arthroplasty. *Knee SurgRelat Res* 2016;28:1–15.
6. Cuni B, Kutsal YG. Is Total Joint Replacement a Solution for Pain in KneeOsteoarthritis? *J PMR Sci* 2014;17:99–106.
7. Hulka BS, Zyzanski SJ, Cassel JC, Thompson SJ. Scale for the measurement of attitudes toward physicians and primary medical care. *MedCare* 1970;8:429–36.
8. Lau RL, Gandhi R, Mahomed S, Mahomed N. Patient satisfaction after total knee and hip arthroplasty. *Clin Geriatr Med* 2012;28:349–65.
9. Janse AJ, Gemke RJ, Uiterwaal CS, van der Tweel I, Kimpen JL, Sinnema G. Quality of life: patients and doctors don't always agree: a meta-analysis. *J Clin Epidemiol* 2004;57:653–61.
10. Harris IA, Harris AM, Naylor JM, Adie S, Mittal R, Dao AT. Discordance between patient and surgeon satisfaction after total jointarthroplasty. *J Arthroplasty* 2013;28:722–7.
11. Altman R, Asch E, Bloch D, Bole G, Borenstein D, Brandt K, et al. Development of criteria for the classification and reporting of osteoarthritis. Classification of osteoarthritis of the knee. Diagnostic and Therapeutic Criteria Committee of the American Rheumatism Association. *Arthritis Rheum* 1986;29:1039–49.
12. Tuzun EH, Eker L, Aytar A, Daskapan A, Bayramoglu M. Acceptability, reliability, validity and responsiveness of the Turkish version of WOMAC osteoarthritis index. *Osteoarthr Cartil* 2005;13:28–33.
13. Koçyiğit H, Aydemir O, Fişek G, Memiş A. Kısa form36(KF36)'nın Türkçe versiyonunun güvenilirliği ve geçerliliği. *İlaç ve Tedavi Derg* 1995;12:102–6.
14. Price DD, McGrath PA, Rafii A, Buckingham B. The validation of visual analog scales as ratio scale measures for chronic and experimental pain. *Pain* 1983;17:45–56.
15. Bourne RB, Chesworth BM, Davis AM, Mahomed NN, Charron KDJ. Patient satisfaction after total knee arthroplasty: who is satisfied and who is not? *Clin Orthop Relat Res* 2010;468:57–63.
16. Jacobs CA, Christensen CP. Factors influencing patient satisfaction two to five years after primary total knee arthroplasty. *J Arthroplasty* 2014;29:1189–91.
17. Dunbar MJ, Richardson G, Robertsson O. I can't get no satisfaction after my total knee replacement: rhymes and reasons. *Bone Joint J* 2013;95-B(11 Suppl A):148–52.
18. Du H, Tang H, Gu J, Zhou YX. Patient satisfaction after posterior-stabilized total knee arthroplasty: A functional specific analysis. *Theknee* 2014;21:866–70.
19. Noble PC, Conditt MA, Cook KF, Mathis KB. The John Insall Award: Patient expectations affect satisfaction with total knee arthroplasty. *Clin Orthop Relat Res* 2006;452:35–43.
20. Williams DP, Price AJ, Beard DJ, Hadfield SG, Arden NK, Murray DW, et al. The effects of age on patient-reported outcome measures in total knee replacements. *Bone Joint J* 2013;95-B:38–44.
21. Singh JA, Gabriel S, Lewallen D. The impact of gender, age, and preoperative pain severity on pain after TKA. *Clin Orthop Relat Res* 2008;466(11):2717–23.
22. Kim TK, Chang CB, Kang YG, Kim SJ, Seong SC. Causes and predictors of patient's satisfaction after uncomplicated total knee arthroplasty. *J Arthroplasty* 2009;24:263–71.
23. Thambiah MD, Nathan S, Seow BZ, Liang S, Lingaraj K. Patient satisfaction after total knee arthroplasty: an Asian perspective. *Singapore Med J* 2015;56:259–63.
24. Maratt JD, Lee Y, Lyman S, Westrich GH. Predictors of satisfaction following total knee arthroplasty. *J Arthroplasty* 2015;30:1142–5.
25. Gong L, Dong JY. Patient's personality predicts recovery after total knee arthroplasty: a retrospective study. *J Orthop Sci* 2014;19:263–9.