Schematic algorithm for surgical treatment of idiopathic granulomatous mastitis using combined steroids and therapeutic mammoplasty techniques

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Introduction
Idiopathic granulomatous mastitis (IGM) is a rare, benign, chronic, inflammatory lesion of the breast of unknown etiology. Clinically, it can be mistaken for inflammatory and neoplastic disorders of the breast. Laboratory investigations with culture and sensitivity, PCR for *Mycobacterium tuberculosis* and core needle biopsy are crucial. Treatment is controversial, but oral steroids are usually started with, followed by surgical resection if there is no complete response.
Aim
This study discusses the use of therapeutic mammoplasty techniques to excise the mass and preserve breast aesthetic appearance concerning patient satisfaction and recurrence.
Patients and methods
Fifty IGM patients were included with moderate to large breasts with masses 20–50% of the breast size after failure of medical treatment with prednisolone, or occurrence of therapy-related complications.
Preoperative core needle biopsy, smear for Ziehl–Nelseen acid fast staining, and culture and sensitivity test. Mammography and ultrasonography were done. An informed consent was obtained regarding the operative procedure and research. On surgery we excise the inflammatory mass with a rim of normal nonaffected tissues around with most of retroareolar duct system. Patients were followed up for 1 year in regular outpatient visits, where recurrence and patients' satisfaction were assessed.
Results
The most important postoperative complication was disease recurrence (4%) and deformity (10%). The most common one was minor wound dehiscence (40%). For patient satisfaction, the median mean percent satisfaction score was 74.50%.
Conclusion
The use of therapeutic mammoplasty in surgical management of IGM has low recurrence rate and high postoperative patient satisfaction.

Keywords:
idiopathic granulomatous mastitis, surgical management, therapeutic mammoplasty

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Introduction

A consensus is lacking for idiopathic granulomatous mastitis (IGM) satisfactory management plan [1–7]. Clinically, firm masses, erythema, nipple inversion, abscesses, ulcerations, sinus tracts, or axillary lymphadenopathy might be noticed (Fig. 1) [8,9]. Core needle biopsy is diagnostic [10]. Treatment is controversial; some prefer medical treatment including oral prednisolone, methotrexate, or rifampicin, while others prefer surgical wide local excision up to mastectomy in an intractable extensive disease [1,10–12].

In this study, an algorithm for IGM treatment is suggested (Fig. 2), starting with prednisolone [7]. Patients who responded were followed for 1 year. Others were candidates for surgery. Previously, the patients suffered postoperative disfigurement and poor satisfaction. The aim was to support surgical excision using therapeutic mammoplasty and to evaluate postoperative recurrence and patient satisfaction [13].

Patients and methods

Ethical approval

The research protocol was approved by the local ethics committee. An informed consent was obtained from every patient undergoing this research clarifying

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patient acceptance for surgical intervention as well as experimental study.

Patients

Fifty female IGM patients, with moderate to large breasts (brassiere size B or more), whose breast masses between 20 and 50% of the breast size after medical treatment failure using prednisolone for 8 weeks (i.e. no complete clinical improvement), or occurrence of steroid related complications during the period from January 2016 to June 2017. Patients with specific granulomatous mastitis, small breasts, or masses less than 20% or more than 50% of the breast size, and patients with any contraindication for corticosteroid therapy were excluded from the study.

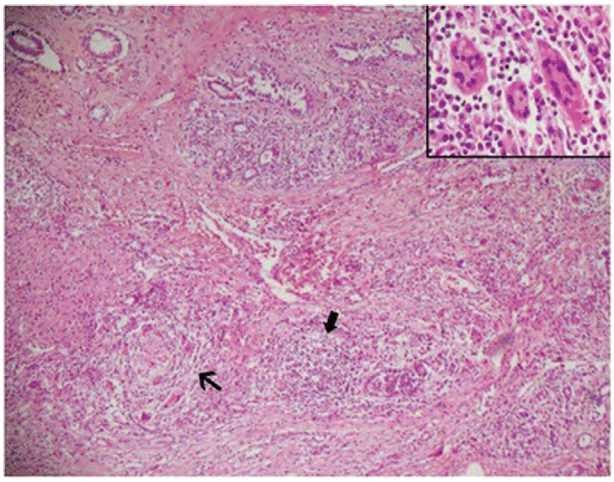
Methods

Tissue diagnosis is of major importance in the diagnosis of IGM. Histopathology shows granulomatous inflammatory response affecting the breast lobules composed of epithelioid histiocytes, with occasional Langhans-type multinucleate giant cells, eosinophils, and scanty collections of polymorph-nuclear leukocytes (Fig. 3) [14]. They are usually small, well circumscribed and confined to the lobules, but obliteration of the lobular architecture by sheets of epithelioid cells and microabscesses may be present. Sometimes, marked ductular damage might be found, with ulceration of the epithelium and polymorphs in the lumen [15]. Outside the microabscesses, lack of caseation within the granuloma that is centered on the lobule is considered pathognomonic for IGM.

Fig. 1

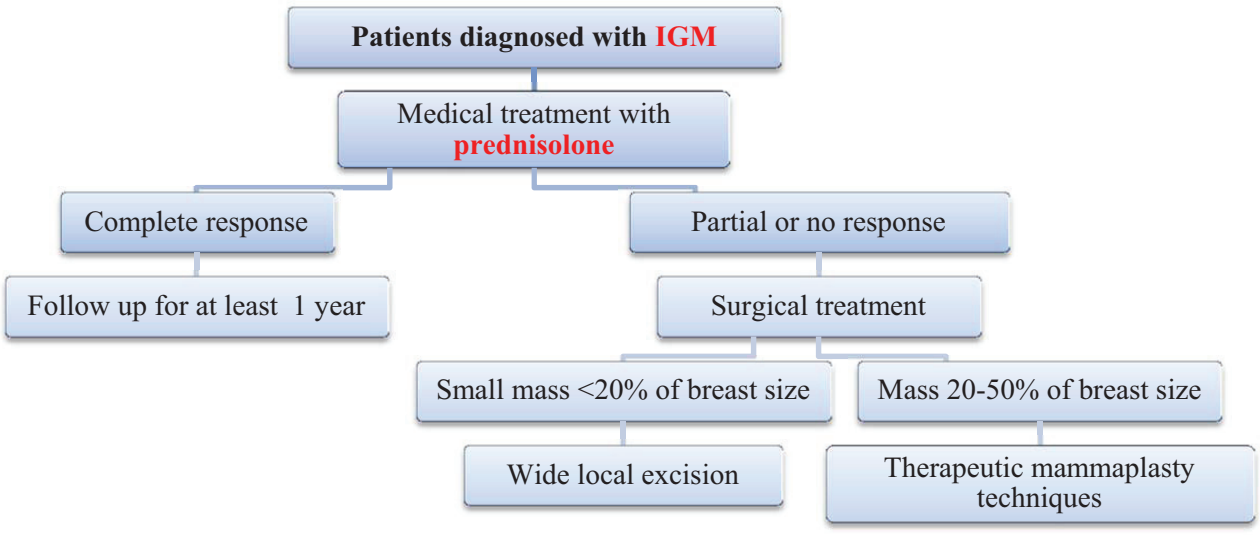
A 35-year- old idiopathic granulomatous mastitis patient with breast mass, abscess, and multiple sinuses.

Fig. 3



Granulomatous mastitis: 4× magnification showing a forming granuloma (thin arrow) in the background of diffuse lymphoplasmacytic infiltration (thick arrow) of breast parenchyma with scattered giant cells (inset, 40×) [14].

Fig. 2



Algorithm for idiopathic granulomatous mastitis treatment.

After histopathologic confirmation with core needle biopsy, and ensuring absence of bacterial infection using culture and sensitivity test and Ziehl–Neelsen staining for *Mycobacterium tuberculosis*, medical treatment was initiated for all patients diagnosed with IGM with prednisolone. A median initial dose of 0.5 mg/kg/day was usually used. Patients who responded to medical treatment within 6–8 weeks; tapering of prednisolone dose was done by 0.1 mg/kg/day, weekly or biweekly; and subsequent follow-up for these patients was applied without surgical intervention. Failure to respond to medical therapy, corticosteroid-related complications, or contraindication to use are considered indications for surgical treatment. Patients with small masses (< 20% of breast volume) have undergone wide local excision. Only patients having moderate to large breasts and with masses 20–50% of the breast size after prednisolone treatment were included in this study (Fig. 2).

Preoperative workup for all patients with a provisional diagnosis of IGM included, in addition to what previously mentioned, complete history taking, clinical examination, and routine laboratory investigations. Radiological investigations in the form of mammography and ultrasonography were also obtained. An informed consent was obtained from all participants regarding the operative procedure as well as the research.

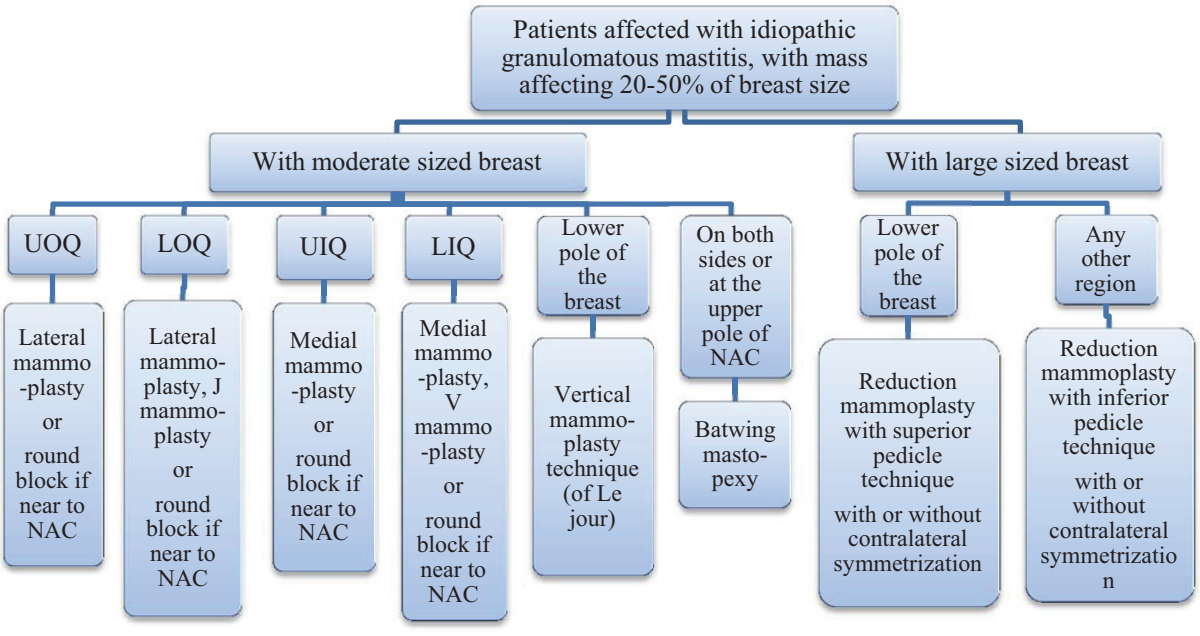
Operative technique

On surgery; we excise the inflammatory mass with a rim of normal nonaffected tissues around, in association with excision of most of the retroareolar duct system; which is thought to be the site of disease origin. The choice of the appropriate surgical technique is dependent on three main factors, namely, breast size, mass location, and breast mass ratio [16]. Figure 4 shows an algorithm for the choice of appropriate technique according to the previously described factors, which is developed in our institute for managing such cases. Figure 5a and b show

Fig. 5

(a) A 36-year patient with left breast idiopathic granulomatous mastitis mass in the upper inner quadrant, with marking for inferior pedicle reduction mammaplasty on both sides and (b) 6 months postoperative view of the same patient.

Fig. 4



Algorithm showing different mammoplasty techniques choice according to the breast size, proximity to the NAC and mass location. LIQ, lower inner quadrant; LOQ, lower outer quadrant; NAC, nipple areola complex; UIQ, upper inner quadrant; UOQ, upper outer quadrant; .

Table 1 The Kyungpook National University Hospital breast reconstruction satisfaction questionnaire [19]

Q	Question	Very				Very
Q1	Overall satisfaction with my breast reconstruction	1	2	3	4	5
Q2	Symmetry of my breasts	1	2	3	4	5
Q3	Size of my reconstructed breast	1	2	3	4	5
Q4	Shape of my reconstructed breast	1	2	3	4	5
Q5	Feel to touch my reconstructed breast	1	2	3	4	5
Q6	Pain in my reconstructed breast	1	2	3	4	5
Q7	Scar of my reconstructed breast	1	2	3	4	5
Q8	Donor site pain	1	2	3	4	5
Q9	Donor site scar	1	2	3	4	5
Q10	Self-confidence	1	2	3	4	5
Q11	Sexual attractiveness	1	2	3	4	5

preoperative marking of an IGM patient and its 6 months' postoperative result.

Postoperative follow-up: early postoperative complications like bleeding and infection were recorded. All patients were followed up for 1 year in regular visits at the outpatient clinics at intervals of 1.5, 3, 6, and 12 months to detect recurrence. Recurrence was considered only after core needle biopsy and histopathological confirmation. Patients with recurrence after excision underwent re-excision and oral prednisone [17,18].

Patients' satisfaction was assessed by asking the patients to fill the Kyungpook National University Hospital breast reconstruction satisfaction questionnaire during the follow-up visit at 6 months after surgery. Each question is graded on a five-point Likert scale ranging from 'very satisfied (5)' to 'very dissatisfied (1)'. These are 11 questions, and we have deleted the eighth and ninth ones, as these are related to donor site morbidity, which was not applicable in this study. Every patient's individual score is calculated by the sum of scores gained for the remaining nine questions and divided by their number (which is 9), see Table 1 [19].

Statistical analysis of the data [20]

Data were fed to the computer and analyzed using IBM SPSS software package version 20.0. (IBM Corp., Armonk, New York, USA) [21] Qualitative data were described using number and percent. Quantitative data were described using range (minimum and maximum), mean, SD, and median. Significance of the obtained results was judged at the 5% level.

Results

In the current study, all affected patients were women, in the reproductive age group ranging between 16 and 49 years with a median of 33 years. Ninety-eight percent of patients had a history of previous pregnancy. Only a single patient (2%) was adolescent (16 years old), and nulliparous. Number of full-term pregnancies of parous females varied from a single previous pregnancy (14%) up to five pregnancies (2%), with a median of 3. Multiparous women constituted 84% of the study group. Duration since the last pregnancy has ranged between 0 up to 144 months, concerning that one patient was pregnant at the time of presentation, and the other who was nulliparous. The median duration was 40.0 months. Two amenorrheic patients (4%) aged 26 and 49 years were noticed. The 26-year old amenorrheic patient was affected with hyperthyroidism, which was the etiological factor of amenorrhea, and resolved after appropriate management. Regular menstruation is noticed in 66%, while 30% were suffering from irregular menstruation.

Contraceptive methods were commonly used (84.0%) at a time before disease presentation. The nonhormonal intrauterine device was the most common (52% of the total number of patients) and the vaginal ring was the least (4%). Oral contraceptive pills, injection, and implants constituted the less frequently used means, with 12.0, 10.0, and 6.0%, respectively.

The majority (80%) of the affected patients in this study had a history of breast feeding. Of these, 52% has lactated from both sides, while 26% from the opposite side; and only a single (2%) patient has lactated from both but more on the contralateral side. The duration of lactation varied from 2 months up to 24 months with a median of 17 months. Ipsilateral mastitis mandating surgical drainage before definitive surgery was noticed in 64% of patients, while surgical drainage for contralateral abscesses was noticed in 10%.

None of the affected women was an active smoker (0%). Despite that passive smoking was noted in 50% of patients. Patients who suffer from collagen vascular disease with IGM constituted 6% of the study group.

Of the 50 patients who constitute the study group, 52 breasts were found to be affected, in two patients who had bilateral disease (4%). Equal distribution of right and left sides with 48% for each was found. About the disease extent, in 34 (65.38%) of the 52 affected breasts, up to 20% of the breast size was involved. In 21.15% (11 breasts), involvement of greater than 20–30% of breast size was noticed. Mass sizes occupying greater than 30–40% and greater than

Table 2 Data related to disease presentation, preoperative evaluation, and management

	n (%)	
Side and extent of disease		
Side of the disease		Disease extent Minimum–maximum=20.0–50.0% Mean±SD=24.70±7.79% Median=20.0%
Right side	24 (48.0)	
Left side	24 (48.0)	
Bilateral disease	2 (4.0)	
Disease presentation		
Mass	50 (100.0)	
Mass as a solitary presentation	14 (28.0)	
Sinus with a mass	15 (30.0)	
Abscess with a mass	16 (32.0)	
Ulcer with a mass	5 (10.0)	
Operative technique		
Round block excision	20 (40.0)	Operative time (minutes) Minimum–maximum=60.0–180.0 Mean±SD=100.50±22.07 Median=95.0
Lateral mammoplasty	11 (22.0)	
Medial mammoplasty	8 (16.0)	
Inferior pedicle mammoplasty	4 (8.0)	
Batwing excision mammoplasty	3 (6.0)	
Superior pedicle mammoplasty	3 (6.0)	
Vertical mammoplasty	1 (2.0)	
Intraoperative size (intraoperative) in comparison to preoperative evaluation (preoperative)		
Both are equal (intraoperative=preoperative)	32 (64.0)	
Intraoperative<preoperative	10 (20.0)	
Intraoperative>preoperative	8 (16.0)	
Effect of preoperative oral prednisolone on mass size		
Mass size reduced	28 (56.0)	
Mass size not affected	20 (40.0)	
Not applicable (contraindicated)	2 (4.0)	

40–50% of breast volume were seen in five and two breasts (9.62 and 3.85%), respectively.

The site of breast involvement varied according to breast quadrant. The most commonly affected site was the upper outer quadrant (36.54% representing 19 breasts), while the least common was shared by three regions; namely the lower pole, central quadrant, and lower inner quadrant affecting 7.69% (four breasts) for each. In between, in a descending order of frequency, lie the upper inner quadrant, lower outer quadrant, and upper pole with 15.38, 13.46, and 11.54%, respectively. The side and extent of the disease, clinical presentation, preoperative prednisolone treatment response, operative details, and intraoperative mass size compared with preoperative evaluation are all summarized in Table 2.

Fig. 6

Minute wound dehiscence in 29-year old patient 2 weeks after Batwing excision mammaplasty.

In the present study, minor wound dehiscence (40%) (see Figs 6 and 7 and Table 3) constituted the most frequent

Fig. 7

Periareolar wound dehiscence 3 weeks after raquet mammaplasty in 31-year-old patient.

Table 3 Distribution of the studied cases according to complications

	Number of complications (%)
Minor wound dehiscence	20 (40.0)
Seroma	14 (28.0)
Nipple sensory loss	10 (20.0)
Wound infection	10 (20.0)
Deformity	5 (10.0)
Disease recurrence	2 (4.0)
Bleeding and hematoma	2 (4.0)
NAC ischemia (transient)	1 (2.0)

NAC, nipple areola complex,

Table 4 Combination of different types of complications

	Number of patients (%)
No complications	12 (24.0)
Single complication	16 (32.0)
Double complications	17 (34.0)
Triple complications	4 (8.0)
Four simultaneous complications	1 (2.0)

Table 5 Descriptive analysis of the studied cases according to patient satisfaction

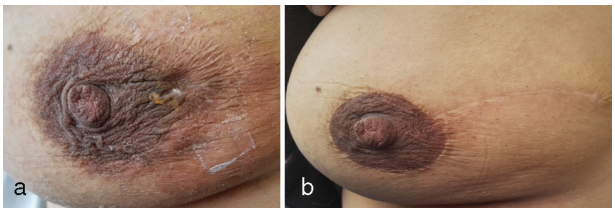
	Mean % score	*n* (%)
>3.75/5	>75%	25 (50.0)
KNUH score	50–75%	20 (40.0)
<2.5/5	<50%	5 (10.0)
KNUH score	Mean % score	
Minimum–maximum=1.89–4.55	Minimum–maximum= 37.80–91.0%	
Mean±SD=3.53±0.73	Mean±SD=70.54±14.52%	
Median=3.73	Median=74.50%	

KNUH, Kyungpook National University Hospital.

postoperative local complication, while nipple areola complex transient venous ischemia was the least (2%). The most important postoperative complication in this current study was the disease recurrence, which contributed to 4% of the included patients. Tables 3 and 4 summarize the analysis of postoperative complications.

Half of the study group obtained a mean percent score of above 75%. Only five patients (10%) gained a mean percent score less than 50%. This indicates high patient satisfaction scores in this study (Table 5). Figs 8a, b, 9, and 10 show postoperative aesthetic results.

Fig. 8



(a) Preoperative view of a 33-year old patient affected with right upper inner quadrant idiopathic granulomatous mastitis. (b) 9 months post-operative view of medial mammoplasty for the same patient.

Fig. 9

A 26-year idiopathic granulomatous mastitis patient 3 months after right superior pedicle mammoplasty for a lesion at the lower pole of the right breast.

Fig. 10

A 32-year-old idiopathic granulomatous mastitis patient 1 year after left superior pedicle mammoplasty and right symmetrization.

Discussion

In the current study, there are two main concerns. First, to diagnose patients accurately suffering from IGM as it is considered a difficult clinical issue, confusing with other causes of specific granulomatous mastitis, namely bacterial infection or tuberculosis. Second, to improve the surgical techniques used for disease excision, modifying the conventional wide local excision techniques used in other studies, especially if we are dealing with a large mass. That was leading in the past to postoperative deformities or sometimes to simple mastectomy. Paying attention to that it is a benign disease affecting middle-aged women in the reproductive period of their lives. The former

methods of surgical management has led to disastrous psychological insults to the affected women. In the era of oncoplastic surgery; we have used the same principles to surgically excise the mass following therapeutic mammoplasty rules.

Postoperatively, we observed postoperative complications for patients who are affected with IGM undergoing therapeutic mammoplasty techniques, especially disease recurrence as well as postoperative patient satisfaction.

Generally, lack of sufficient number of studies that discuss the use of therapeutic mammoplasty techniques in IGM management is considered limiting for the comparative purpose. Yet, we can consider the postoperative local complications for surgical management in the form of wide local excision of the disease in general as a guide for the same purpose.

In the present study, minor wound dehiscence (40%), seroma (28%), and nipple sensory loss as well as wound infection (each representing 20%) constitute the most frequent postoperative local complications, in the descending order of frequency.

The most important postoperative complication in this current study was disease recurrence, which contributed to 4% of the included patients.

In a multicenter study on 720 IGM patients, the overall incidence rate of first recurrence was 17% (n=122). IGM re-recurrence after treatment of patients was 3% (n=22). Their results have shown that there are statistically significant associations between IGM recurrence and pregnancy, breastfeeding, smoking, and history of breast infection ($P<0.05$) [22]. In other studies, postexcision recurrence rates of 16–50% have been reported for IGM [23–25].

This ascertains the lower recurrence rate in the current study and the success of therapeutic mammoplasty techniques in decreasing the recurrence rates in surgically treated IGM patients.

Aggressive radical surgical management of the disease was observed in studies. Successful surgical management of three affected women with mastectomy and primary breast reconstruction was noticed in Austria [26]. In that study, all women were of reproductive age with a mean of 30.3 years. All patients had previously undergone surgery (wide local excisions) for diagnosis and therapy and were treated with antibiotics; however, all showed recurrence. As a result, all had undergone mastectomies (either modified radical or skin sparing) with autologous flap reconstruction. In conclusion, all cases experienced aesthetically pleasant results, without apparent recurrence [26].

This result might favor the treatment protocol presented in the current study with less aggressive surgical approach, higher aesthetic results, and patient satisfaction scores, as well as low recurrence rates.

Gupta *et al*. [27] reported rates of wound infection in a phase III study of prophylactic amoxicillin/clavulanic acid (17.7%) versus placebo (18.8%). These results may approximately be close to our final data.

In the current study, patient satisfaction was notably high, as half of the study group obtained a mean percent score of above 75%. Only five (10%) patients gained a mean percent score less than 50%. The edian mean percentage satisfaction score was 74.50%.

The inflammatory nature of the disease, high patient expectations regarding benign breast disease management, preoperative deformity, postoperative complications as well as disease recurrence did not decrease the overall high satisfaction scores in IGM patients treated with therapeutic mammoplasty techniques used in the current study, in comparison to other conventional surgical methods [12].

Conclusion

The use of therapeutic mammoplasty techniques is a successful novel surgical management of steroid-resistant IGM, involving 20–50% of the breast volume of moderate to large breasts, with lower postoperative recurrence rates and high patient satisfaction

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Conflicts of interests

There are no conflicts of interest.

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