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Is Cosmesis the Choice for An Appendicectomy?

Dr. Nisha Thambuchetty[1], Dr. Rakesh Rai[2]

[1]Post Graduate, Department of General Surgery, Father Mullers Medical College, Mangalore, India

[2]Professor, Department of General Surgery, Father Mullers Medical College, Mangalore, India

Abstract: ***Open appendectomy is a time tested technique while laparoscopic appendectomy is newer concept. Small Incision Open Appendectomy was done via 2-3 cm incision at McBurney's point and Laproscopic Appendectomy was done via standard 3 port technique. Our Objective was to compare small incision open appendectomies with laparoscopic appendectomies.In the present study a total 60 patients with appendicitis were selected, of whom 30 underwent SIOA (small incision open appendectomy) and remaining 30 underwent LA (laparoscopic appendectomy). Both the technique were compared in terms of operative time, post-operative pain, analgesic requirement, post-operative length of stay, time to return to daily activities, complications, conversion rate, cost and cosmetic outcome.The results showed that SIOA is better than LA in terms of operative time (mean 25 vs. 44 minutes), time to return to daily activity (mean 4.8 vs. 6.2 days). SIOA and LA were comparable in terms of Post-operative pain (mean 5.3vs 5.9 at POD1), analgesics requirement (mean 5.96 vs. 5.93 doses), post-operative hospital stay (mean 2.9 vs. 3.5 days) and cosmetic effect. The cost was higher in LA group compared to SIOA. SIOA is the method of choice in thin and lean patients as LA offers no advantage over SIOA in this group while increasing costs.LA is the preferable method for obese patients. SIOA takes less time than LA.SIOA is comparable to LA in terms of post-operative pain, analgesics requirement, hospitals stay and return to daily activities. SIOA is more economic and cost-effective than LA.SIOA is cosmetically as good as LA.***

Keywords: LA-laparoscopic appendectomy; SIOA-small incision openappendectomy; cosmetic results; cost effectiveness; duration of surgery

1. Introduction

The first report of an appendectomy came from Amyand, a surgeon of the English army. Amyand performed an appendectomy in 1735 without anesthesia to remove a perforated appendix. At the end of the 19th century, the English surgeon H.Hancock successfully performed the first appendectomy in a patient with acute appendicitis. Some years after this, the American C. McBurney published a series of reports that constituted the basis of the subsequent diagnostic and therapeutic management of acute appendicitis. Thousands of classic appendectomies (ie, open procedure) have been performed in the last 2 centuries. Mortality and morbidity have gradually decreased, especially in the last few decades because of antibiotics, early diagnosis, and improvements in anesthesiologic and surgical techniques.

Appendectomy by McBurney's incision remained the procedure of choice for nearly a century until 1983 when Kurt Semn offered an alternative, "laparoscopic appendectomy". During the early part of twentieth century with the development of technology and development in surgery, an era of minimal access surgery including NOTES (Natural Orifice Trans-luminal Endoscopic Surgery) and SILS (Single Incision Laparoscopic Surgery) has emerged. Laparoscopy has gained a global popularity, which has been supported by the advances in anaesthesia, asepsis and antisepsis. The advances in imaging techniques, fibre-optic systems and introduction of microchip camera have globalized the laparoscopic technique. It is a newer technique but open appendectomy although an older procedure is a time-tested technique and there a still debate rages on as to which technique is superior to another. Here in this study laparoscopic and small incision open appendectomy are compared in various aspects and conclusion drawn from that.

Successful appendectomy was first described by McBurney in 1894 [1], and the open surgical approach remained the gold standard for nearly a century. The lifetime risk ofdeveloping appendicitis is between 7 and 9% with evidence of increasing incidence [2],[3].

With the advance of minimal invasive surgery, new approaches for the existing operations have been proposed. Semm first described the laparoscopicapproach for acute appendicitis in 1983 [4]. Although there has been a controversy at the beginning, laparoscopic appendectomy (LA) has become common and an acceptableapproach in the management of acute appendicitis [5]. LA has become favored over open surgical methods for its association with decreased postoperative pain, more rapid return to daily activities, and improved cosmetic results. However, the literature has shown the association of laparoscopy with specific adverse events such asincreased intra-abdominal abscess and hospital costs [6]. The present study aimed to compare both laparoscopic and mini-incision appendectomies in terms of operation duration, postoperative complications, length of hospital stay, cost analyses, and cosmetic results.

2. Objectives

The present study is aimed to compare laparoscopic and small incision open appendectomies in terms of operation duration, postoperative complications, and length of hospital stay, cost analyses, and cosmetic results.

3. Materials and Methods

The study was a Prospective Study the data was obtained from 60 patients who met a pre-defined criteria and consented to get operated for Appendectomy at Father Muller Medical College Hospital, Mangalore during the

study period of October 2016 to April 2018. Study was initiated after obtaining ethical clearance from the institutions ethical clearance committee.

Inclusion criteria

1) All patients with appendicitis between 15 to 65 years
2) Both the sexes.(male and female)

Exclusion criteria

1) Patient unfit for surgery.
2) Contraindication for laproscopic appendectomy or open method.
3) Those below 15 years of age
4) Those above 65 years of age.

- Operative time
- Post-operative pain
- Post-operative Analgesic requirement
- Post-operative hospital stay
- Time of return to normal activity
- Complications
- Conversion rate
- Cost effectiveness
- Cosmesis

The duration of operative time is considered from the skin incision to the closure of wound in both the techniques.

Post-operative pain was recorded in terms of Visual Analogue Scale (VAS) on day 1 and at the time of discharge.

The requirements of analgesics inform of injectable and oral diclofenac sodium was noted in both groups post operatively.

Choice of antibiotics was dependent on the appendicular pathology and not considering the method used.

The postoperative hospital stay was considered from day of surgery to the day of discharge.

The time taken to return to routine activities was defined as return to usual activity of domestic and social life at the discretion of the patient.

Complications in both groups recorded.

The procedure considered converted to conventional open appendectomy when the incision had to extended in SIOA.

The cosmetic result was evaluated by patients themselves.

Patients were followed up till the time of suture removal

4. Observation and Results

Age

Age of the patients ranged from 15-65 years. Mean age being 27.13. Thisconfirms that appendicitis is primarily a disease of young age.

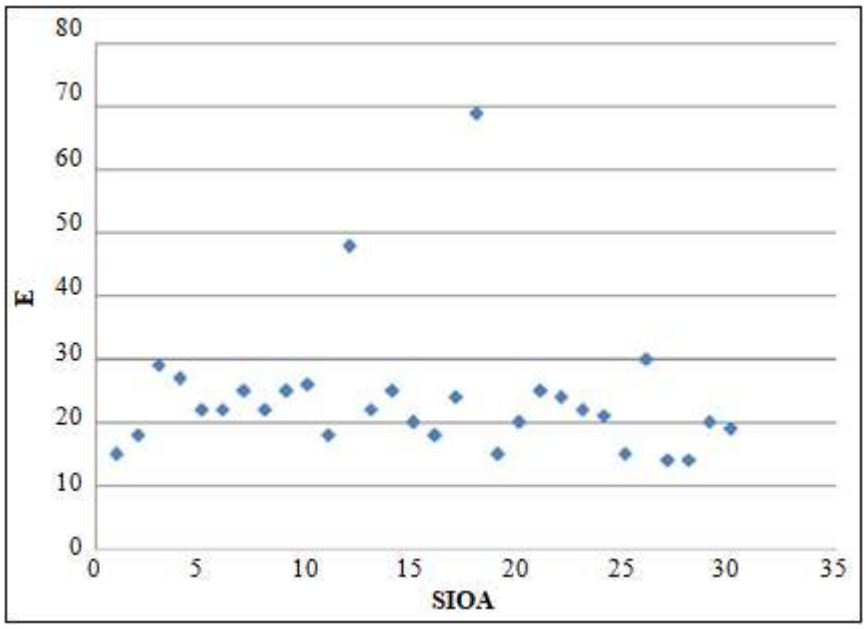

Figure 1: Age distribution in SIOA group

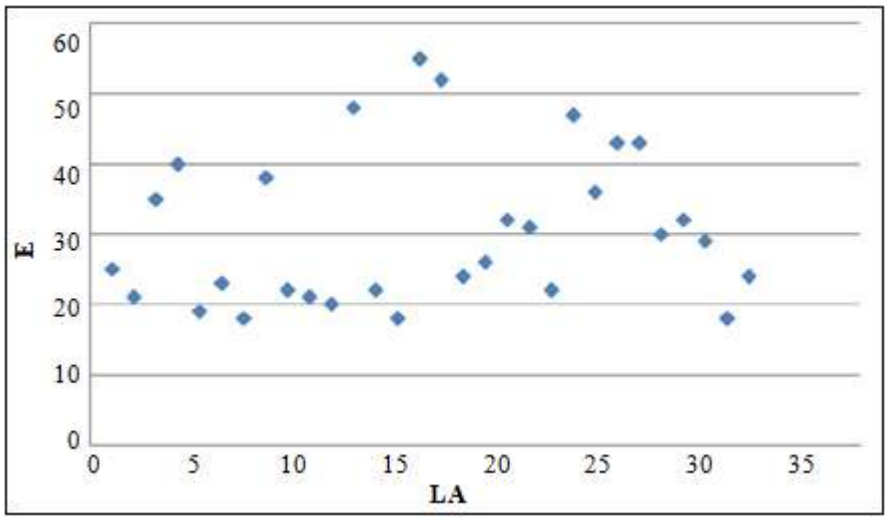

Figure 2: Age distribution in LA group

Sex

Male to female ratio was 1 : 1. There were 30 male and 30female patients in the study.

Operative Time

Table 1: Time taken for surgery (average)

Technique	SIOA	LA
Time(minutes)	25	44

The operative time for SIOA ranged from 20 to 35 minutes, and for LA it ranged from 30 to 60 minutes. The mean time was 25 vs 44 minutes in SIOA vs LA respectively. As the above table shows, the time taken for surgery is significantly high in LA group.

Pain perceived by Patient

Table 2: Pain perceived by patient in terms of VAS score at POD 1 and at discharge

Technique	Pain score (VAS)	
	POD1	Discharge
SIOA	5.3	1.3
LA	5.9	1.6

The VAS scores for SIOA were 3-8 (POD 1), and 1-3 (Discharge). For LA the VAS scores were 4-8 (POD 1), 1-3 (Discharge). As the above table shows there is no much difference in terms of pain perceived by patient at Post-Op Day (POD) 1 and at Discharge. The pain was recorded by visual analogue scale.

Analgesics Requirement

Table 3: Requirement of analgesics in doses

ANALGESIC (iv and oral)	Dose
SIOA	5.96
LA	5.93

Analgesic requirement in both the groups were almost equal. However the difference is not significant.

Analgesic requirement is determined by size of incision, number if incisions, presence of underlying incision, dissection done, patients own pain threshold etc.

Hospital Stay

Table 4: Post-Operative Stay in Hospital in days

Technique	Stay, in days
SIOA	2.9
LA	3.5

Post-operative stay was comparable in both the groups.
It ranged 2-7 days in both groups with mean 2.9 days in SIOA group as compared to mean 3.5 days in LA group.

Time to return to daily activity

Table 5: Time required returning to daily activity (RDA)

Technique	RDA, in days
SIOA	4.8
LA	6.2

The time required to return to daily activity means patient is able to do his daily routine work. The time taken for return to daily activity was 4.88 days (3-9 days) in SIOA group compared to 6.2 days (4-10 days) in LA group which was significantly lower. This may be attributed to lesser invasiveness of SIOA technique which invades only RIF while LA invades whole peritoneal cavity.

Complications

In SIOA group one patient developed Vomiting in the post operative period.
No local wound infection noted in SIOA.
Umbilical post site infection was noted in a patient with perforated appendix who had underwent LA.

Conversion Rate

In SIOA group out of 30 cases, in 2 cases the incision had to be extended. 2 patients were obese in whom excessive fat obscured the vision through small incision and hence incision was extended. In LA group, none of the cases were converted to OA. Drains were not used in both the groups.

Cost Effectiveness

Equipment: SIOA doesn't require any special instruments. The routine OT instruments set costs around 2 lakhs. LA requires, apart from routine instruments, laparoscopy set

which costs additional 20-25 lakhs. LA is done with endo-loop costs Rs 500/- more.SIOA doesn't require such special equipment. SIOA is done under SA and LA done under GA. GA costs more than SA. Thus overall SIOA (Rs.15806) costs less to the patient when compared with LA (Rs.18033) and to the hospital as well.

Cosmetic Effect

Cosmetic result was recorded by patients own perception. Patients were askedto grade satisfaction in three grades

1) Not satisfied,
2) Equivocal
3) Satisfied with cosmetic result.

All the patients in both the group were satisfied with the cosmetic result.

The main advantage in LA is, the umbilical and supra-pubic scars are hidden by natural camouflages. Only visible scar is in LIF or RIF depending on the port placement. Even this scar is hardly visible as it is hardly a centimeter long.

In SIOA group the final scar is 2-3cm (2.3 cm - mean) long which is when sutured by sub-cuticular sutures becomes almost invisible.

Role of Anaesthesia

General Anaesthesia (GA) is associated with more complications as compared to Spinal Anaesthesia (SA). GA costs more and associated with more complications. GA is more invasive than SA. After GA patient may have respiratory tract complications ranging from sore throat to pneumonia as GA requires endotracheal intubation. Besides the expertise, equipment, man power, drugs, etc. required for GA are costlier than SA. SIOA and OA are usually done under SA and LA always done under GA. Thus SIOA costs less than GA and associated with lesser anaesthesia related complications.

5. Discussion

The treatment of acute appendicitis remained essentially unchanged since its first description by Charles Mc'Burney in 1889 before the New York surgical society. Appendectomy by Mc'Burneys incision remained the procedure of choice for nearly a century until 1983 whenKurt Semm offered an alternative, "laparoscopic appendectomy". But as McBurney"s operation is well tolerated with less morbidity the benefits of laparoscopic appendectomy have been difficult to establish. The putative advantages of the laparoscopic approach are quicker and less painful recovery, fewer postoperative complications and better cosmesis. It allows better assessment of other intra-abdominal pathologies. But the validity of these points remains unconvincing. LA is significantly associated with higher costs and higher incidence of intra-abdominal abscess formation.

There are plethora of Randomized Control Trials and meta-analysis demonstrating superiority of one technique over another.

The SAGES appropriateness conference in 2003 concluded that OA is always better in average patient. However LA may be beneficial in morbidly obese.

Saurland S. et al [7] in the Cochrane database review analyzed 54 studies comparing LA vs. OA. They observed, incidence of Wound infections was less LA. There was threefold increase in Intra Abdominal Abscesses after LA.The operative cost in LA is significantly higher. OA offers shorter operative times. Return to work was similar in LA and OA with no difference. Not a single study reported a significant increase in hospital stay. There was less pain after LA.

Though wound infection rate was high in OA, incidence if Intra Abdominal Abscess was high in LA which is more dangerous complication. Reduction of pain in LA was statistically significant, but not a clinically relevant outcome.

Omar Aziz et al[8], performed a meta-analysis in LA vs OA in children, found no significant complication rate. 18% less hospital cost in OA. 0.48 days less hospital stay in LA group but it is of no significance in paediatric population.

Kathkuda N et al[9] in 2005 performed a double blind study between LA vs OA.

- Wound infection rate: LA 6.2% vs. OA 6.7%
- Intra-abdominal abscess: LA 5.3% vs. OA 3%
- Operative time: LA 80 min vs. OA 60 min
- No difference in activity of pain QOL scores.
- Time to liquid/solid, length of stay, pain, oral analgesics – Not statistically significant.

Cohran C.C. et al[10] in 2005studied LA vs. OA at a teaching hospital and observed,

- OR time (min) - LA 95.7 vs. OA 90.5
- Operating time (min) - LA 57.4 vs. OA 56.3
- Length of stay(days) - LA 2.2 vs. OA 2.6
- Equipment charge: OA $125.32 vs. LA $1,078.70
- Operative time charge: OA $3,022.16 vs. LA $4065.24
- Total Hospital Charges
- All appendectomies: OA $12,310 vs. LA $16,773
- Non-perforated: OA $9,632 vs. LA $14,251
- Perforated: OA $12,215 vs. LA $27,639

Unless patient factors warrant a laparoscopic approach (questionable diagnosis, obesity), open appendectomy remains the most cost-effective procedure in a teaching environment.

Wei B. et al[11] conducted a meta-analysis in 2010. Compared with OA, LA showed advantages of fewer postoperative complications (p = 0.04), less pain (length of analgesia: weighted mean difference [WMD], -0.53), earlier start of liquid diet (WMD: -0.51), shorter hospital stay (WMD, -0.68), and earlier return to work(WMD, -3.09) and normal activity (WMD,-4.73), but a comparable hospital cost (WMD of LA/OA ratio, 0.11) and a longer operative time(WMD,10.71).

Xiaohang Li et al[12] in 2011 in their meta-analysis observed, Operating time was 12.35 min longer for LA.

Hospital stay after LA was 0.60 days shorter. Patients returned to their normal activity 4.52 days earlier after LA and resumed their diet 0.34 days earlier. Pain after LA on the first postoperative day was significantly less (p = 0.008). The overall conversion rate from LA to OA was 9.51%. With regard to the rate of complications, wound infection after LA was definitely reduced, while postoperative ileus was not significantly reduced. However, intra-abdominal abscess, intraoperative bleeding and urinary tract infection after LA, occurred more frequently.

Sporn E. et al analyzed 235473 patients who underwent appendectomy from 2003 to 2009 published data in Journal of American College of Surgeons that LA is associated with 22% and 9% more cost than OA in respectively uncomplicated andcomplicated appendectomy [13].

McGrath B. et al in 2011 reported, LA ($19,978) is costlier than OA ($15,714) based on normalized cost for simple and complex diseases. Cost and complications increase if the case is converted to open. OA remains the most costeffective approach for patients with acuteappendicitis [14].

A Cochrane database survey by Moore D.E. et al[15] was carried out in order to compare cost between LA and OA. In that study, A decision analytic model was developed to evaluate laparoscopic and open appendectomies. The institutional perspective addressed direct health care costs, whereas the societal perspective addressed direct and indirect health care costs. Baseline values and ranges were taken from randomized controlled trials, meta-analyses, and Medicare databases.

From the institutional perspective, open appendectomy was the least expensive strategy, with an expected cost of $5,171,as compared with $6,118 for laparoscopic appendectomy.

The laparoscopic approach was less expensive if open appendectomy wound infection rates exceed 23%. From the societal perspective, laparoscopic appendectomy was the least expensive strategy, with an expected cost of $10,400,as compared with $12,055 for open appendectomy. The decision analysis demonstrated an economic advantage to the hospital of open appendectomy. In contrast,Laparoscopic appendectomy represents a better economic choice for the patient [16].

In terms of cost OA is better than LA but advocates of LA argue that high direct cost associated with LA is compensated by reduction in LOS and decreased indirect cost in LA. Thus there are conflicting results and no surgery is superior over another. In our study we tried to combine benefits of both techniques. The technical simplicity, operative time reduction, cost related issues are addressed by open access, and pain and cosmetic aspect addressed by small incision. The patients selected were non-obese with no significant co-morbidity. There are many studies done exploring this aspect and revealed promising results. Below is the comparison between present and other studies:

Table 6: Results of present study

Technique	SIOA	LA
Operative time, minutes	25	44
Post-op pain (POD 1)	5.3	5.9
Analgesic req.	5.96	5.93
Post-op Stay, days	2.9	3.5
RDA, days	4.8	6.2
Cosmetic result	3	3

Bhasin SK et al[16] did a similar study in 2005where they did mini-appendectomy in 72patients. They observed following results.

Table 7: Results of similar study

Length of incision	2.5– 3.5 cm (2.7 cm)
Operation tome	16 – 45 min (22.3 min)
Incision extension	3 cases
Analgesic used	2-5 doses (2.2 doses)
Hospital Stay	2-7 days (2.3 days)
Return to routines	7-10 days (8.2 days)
Satisfaction	96% (n = 72)
Minor complications	4% (n = 3)

Li Huochuan et al [17], in 2004 did a similar study in a general hospital in china, they reported following figures

- Length of incision: 2.7cm
- Duration of Surgery:30 minutes
- Post-operative analgesics:6 doses
- Post op stay:5 days
- Return to daily activity:7 – 10 days
- Cosmetic result: all patients satisfied

LUO Zhi-fu et al[18], in 200 cases study in 2008 did small incision appendectomy in selected group of patients under local anaesthesia and observed similar findings, comparable to LA. Hae-Hyeon S[19], back in 1998 performed open appendectomy after putting small incision (1.5-2 cm in McBurney's point, microceliotomy) and examining the abdomen via a laparoscope through that incision. The appendix identified and brought out through that small incision with help of laparoscopic guidance and appendectomy was done. Findings are as follows:

- Length of incision: 1.5 – 2 cm
- Duration of Surgery: 30.7 minutes
- Post-operative analgesics: 0.9 doses (nalbuphine 0.2mg/kg)
- Post op stay: 4.1(2-7) days
- Return to daily activity: 7.6 (5 – 14) days.

ZHOU Bing-kun[20] in Minimally Invasive Medical Journal of China in 2006 reported a study of 204 cases of appendectomy performed through a mini-incision in the right lower abdomen. The length of incision was 2-3cm in the right lower abdominal wall. The average postoperative hospital stay was 3.5 days. The procedureimproved wound healing and reduced postoperative pain. Normal activities were resumed 8-15 days after operation. Conclusion-Appendectomy performed through a mini-incision in the right lower abdomen can improve wound healing, reduce post-operative pain, and resume normal activities earlier. It can be applied to simple appendicitis, early-stage suppurative or gangrenous appendicitis.

In paediatric age group also, in an article published in International JournalOf Surgery, Malik AH et al[21] from Srinagar, India reported the feasibility of similar approach in 2007.The above data shows, the present study is in parallel with other similar studies. All the studies show, SIOA is comparable to LA in terms of post-operative pain, analgesic requirement, length of stay, conversion rate and cosmetic effect. SIOA is better than LA in terms of operative time, return to daily activity, complications and cost.

It is noticeable that studies on Small incision open appendectomies are done mostly in China and India, where public health system is bursting at the seams, patient load is huge and cost factor is very important. All studies have reported that in patients diagnosed with appendicitis, and who are not obese, Small incision appendectomy is a good choice.

However, in obese patients Laparoscopic appendectomy isa better choice. In an article published in American Journal of Surgery, Varela JE, Hinojosa MW, Nguyen NT reported: "Compared to open appendectomy, laparoscopic appendectomy was associated with a shorter length of stay(3 vs. 4 days) and a lower overall complication rate (9% vs.17%). Most notably, a lower rate of wound infection was noted (1% vs. 3%). Within a subset analysis of morbidly obese patients who underwent appendectomy for perforatedappendicitis, there was a higher overall complication rate(27% vs. 18%) and cost ($16,600 vs. $12,300) in the openappendectomy group. Laparoscopic appendectomy shouldbe the procedure of choice for the treatment of appendicitis in obese population.

6. Summary

Over last 30 years numerous studies have been done comparing OA and LA. Some studies show OA better thanLA and some studies show vice versa. This study was undertaken to compare small incision open appendectomySIOA and LA. SIOA combines benefits of both the techniques. The operative time, simplicity of procedure andcost are addressed by open access, while post-operative analgesic requirement, post-operative stay and cosmeticeffect are addressed by small incision.

In present study total 60 patients with appendicitis were selected, 30 of which underwent SIOA and 30 underwent LA. SIOA was done via2-3 cm incision at McBurney's point and LA was done via standard 3 port technique. Both the technique were compared in terms of operative time, post-operative pain, analgesic requirement, post-operative length of stay, time to return to daily activities, complications, conversion rate, cost and cosmetic outcome.

The results showed that SIOA is better than LA in terms of operative time (mean 25 vs. 44 minutes), time to return to daily activity (mean 4.8 vs. 6.2 days). SIOA and LA were comparable in terms of Post-operative pain (mean5.3/1.3 vs. 5.9/1.9 at POD1 and discharge), analgesics requirement (mean5.96vs. 5.93doses), post-operative hospital stay (mean 2.9 vs. 3.5days) and cosmetic effect.The cost was higher in LA group compared to SIOA. In obese patients SIOA was converted to OA in 2 patients and LA was done without much trouble in obese patients as well.

7. Conclusion

It can be concluded, thus that, Small incision appendectomy is a feasible approach. When diagnosis of appendicitis is certain SIOA should be performed. SIOA is the method of choice in thin and lean patients as LA offers no advantage over SIOA in this group while increasing costs. LA is the preferable method for obese patients. SIOA takes less time than LA.SIOA is comparable to LA in terms of post-operative pain, analgesics requirement, hospital stay and return to daily activities. SIOA is more economic and cost-effective than LA. SIOA is cosmetically as good as LA.

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