Update on Gluteal Fat Grafting Safety

Karol A Gutowski, MD, FACS

AMERICAN SOCIETY OF PLASTIC SURGEONS®

33RD ANNUAL ASPS
BREAST SURGERY & BODY CONTOURING SYMPOSIUM
JULY 19-21, 2018

Austin TEXAS
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Disclosures

None related to this topic

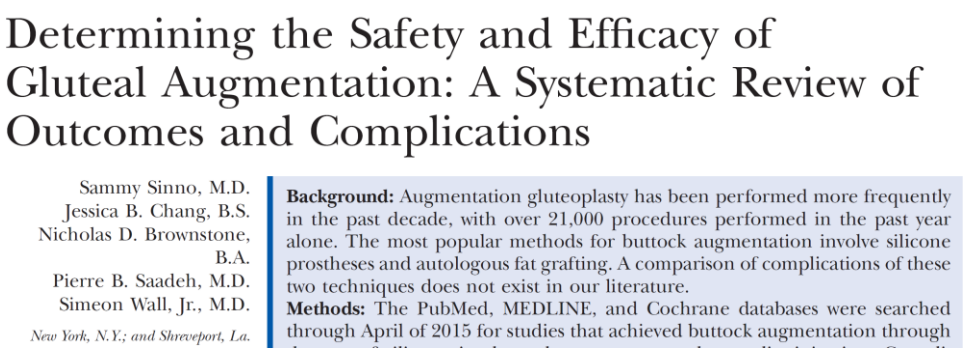
Gluteal Fat Grafting

- >20,000 in 2017 (>18,000 in 2016)
- Estimated 1 in 3000 mortality
- Protocols not standardized
- Performed by non-plastic surgeons
- Deaths continue to be reported

Serious Complications

- Sciatic nerve paresthesia
- Fat necrosis
- Infection
- Sepsis
- Necrotizing fasciitis

COSMETIC



Determining the Safety and Efficacy of Gluteal Augmentation: A Systematic Review of Outcomes and Complications

Sammy Sinno, M.D.
Jessica B. Chang, B.S.
Nicholas D. Brownstone, B.A.
Pierre B. Saadeh, M.D.
Simeon Wall, Jr., M.D.
New York, N.Y.; and Shreveport, La.

Background: Augmentation gluteoplasty has been performed more frequently in the past decade, with over 21,000 procedures performed in the past year alone. The most popular methods for buttock augmentation involve silicone prostheses and autologous fat grafting. A comparison of complications of these two techniques does not exist in our literature.
Methods: The PubMed, MEDLINE, and Cochrane databases were searched through April of 2015 for studies that achieved buttock augmentation through

- 3567 patients in 20 studies
- Fat Embolism 0.08% (1 in 1250)

Cause of Death

- Fatal fat embolism due to
  - Fat entering the venous circulation
  - Associated with injury to the gluteal veins
- Autopsy findings in every patient
  - Fat seen within gluteal muscle
  - No case with fat only in subcutaneous plane

Fat Embolism vs Fat Embolism Syndrome

Fat Embolism

- **Fat globules in pulmonary circulation**
- Acute event during fat injection
- Direct obstruction of major veins
- Cardiorespiratory failure
- Extremely poor prognosis
- Immediate supportive care
- Unknown role for embolectomy

Fat Embolism Syndrome (FES)

- **Rare clinical syndrome**
- Appears 1 to 3 days after liposuction
- Dehydration may contribute
- Respiratory failure
- Neurocognitive deficit
- Skin petechiae
- Supportive therapy & mechanical ventilation
  - Prompt recognition (10% mortality)
  - Late recognition (35% mortality)

Liposuction Releases Fat into Circulation

- Animal study of liposuction
- 60 min after liposuction
  - Fat seen in blood
  - Lipid deposits seen in lungs
- Unknown clinical relevance

EXPERIMENTAL

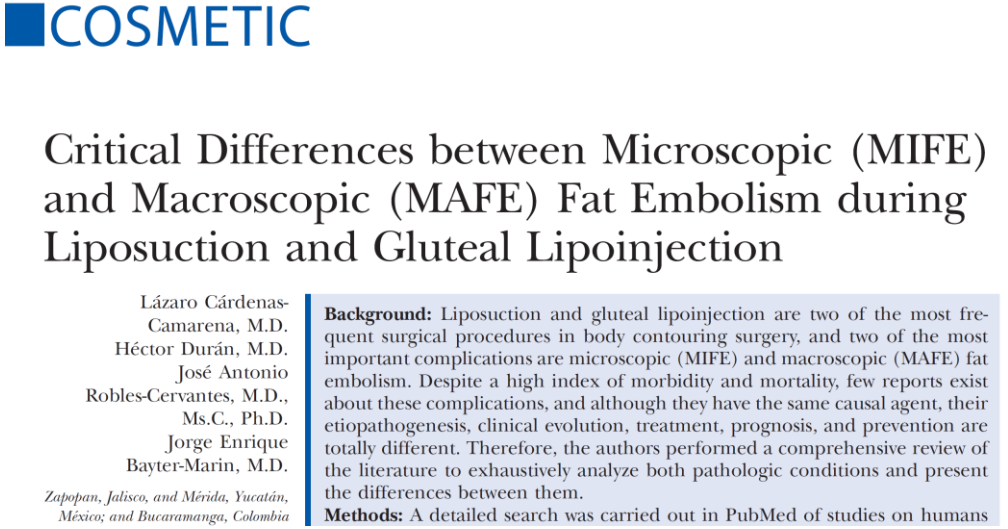
Assessment of the Risk of Systemic Fat Mobilization and Fat Embolism as a Consequence of Liposuction: Ex Vivo Study

Kamal M. El-Ali, F.R.C.S.
Terence Gourlay, Ph.D., F.R.S.H.
London, United Kingdom

Background: Adverse consequences of liposuction, including those associated with fat embolism, have been reported in the literature. Fat embolism syndrome after liposuction may be underestimated because of the unspecific nature of the symptoms. The aim of this study was to determine whether there is a generic risk of the generation of intravascular fat emboli as a consequence of liposuction.

Micro vs Macroscopic Fat Embolism

- Microscopic = Fat Embolism Syndrome
- **Macroscopic = Fat Embolism**
- 15 to 50 mL of fat embolism can kill an adult
- Clinical presentation similar to VTE
- Pig model pattern of cardiac function
  - Immediate **deterioration**
  - 10 to 30 min of **improvement**
  - 30 to 60 min of **worsening until death**



COSMETIC

Critical Differences between Microscopic (MIFE) and Macroscopic (MAFE) Fat Embolism during Liposuction and Gluteal Lipoinjection

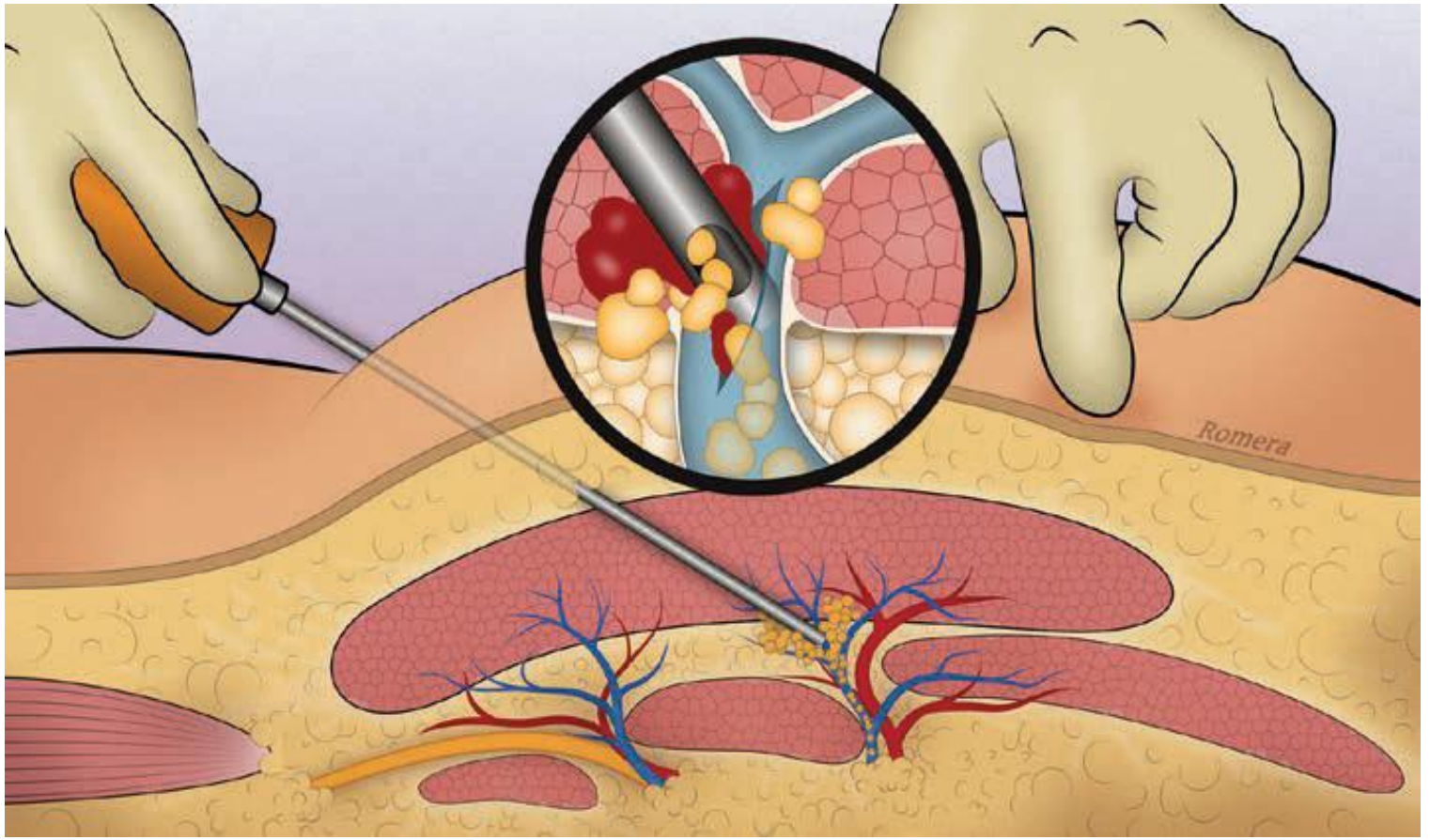
Lázaro Cárdenas-Camarena, M.D.
Héctor Durán, M.D.
José Antonio Robles-Cervantes, M.D., Ms.C., Ph.D.
Jorge Enrique Bayter-Marin, M.D.

Zapopan, Jalisco, and Mérida, Yucatán, México; and Bucaramanga, Colombia

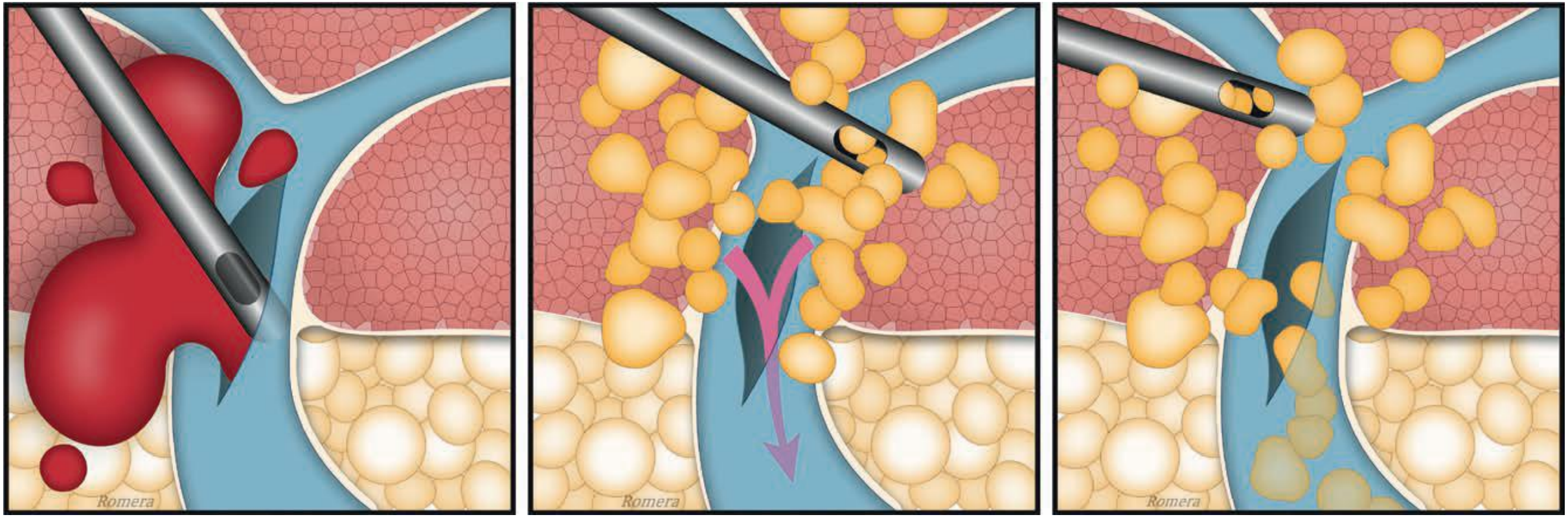
Background: Liposuction and gluteal lipoinjection are two of the most frequent surgical procedures in body contouring surgery, and two of the most important complications are microscopic (MIFE) and macroscopic (MAFE) fat embolism. Despite a high index of morbidity and mortality, few reports exist about these complications, and although they have the same causal agent, their etiopathogenesis, clinical evolution, treatment, prognosis, and prevention are totally different. Therefore, the authors performed a comprehensive review of the literature to exhaustively analyze both pathologic conditions and present the differences between them.
Methods: A detailed search was carried out in PubMed of studies on humans

- Initial intraoperative deterioration may appear to improve. However surgery should be terminated and specialized care should be sought during that 10 to 60 minutes when the patient appears to improve, otherwise, the risk of intraoperative death is very high.

Fat Embolism: Direct Injury to Gluteal Veins



Fat Absorbed by Negative Venous Pressure



Autopsy Results after Buttock Fat Injection

COSMETIC

- Volume of fat injected was NOT large
- Largest 300 cc per buttock
- Average 214 cc per side
- **Intramuscular injection is the problem**

Deaths Caused by Gluteal Lipoinjection: What Are We Doing Wrong?

2015

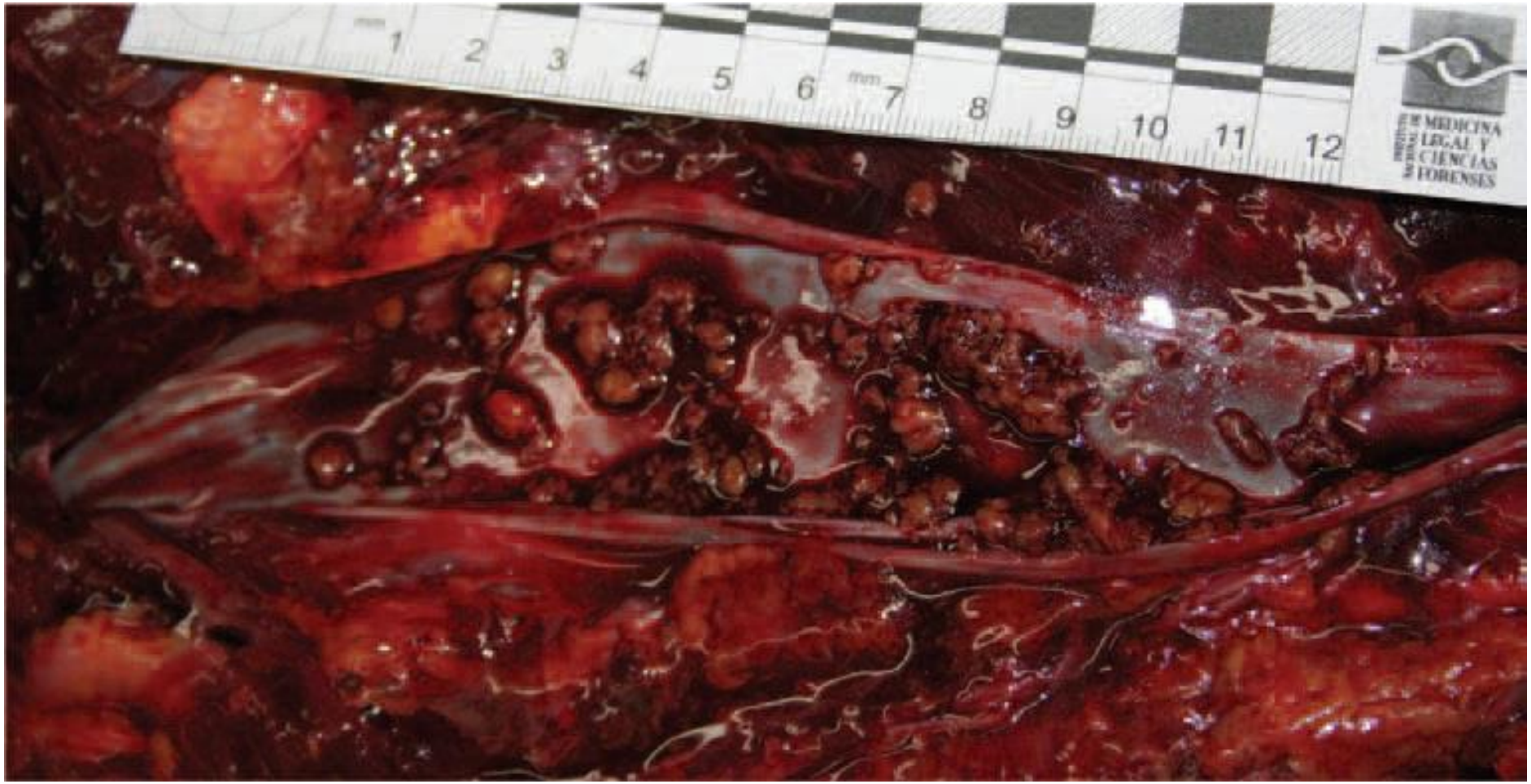
Lázaro Cárdenas-Camarena, M.D.
Jorge Enrique Bayter, M.D.
Herley Aguirre-Serrano, M.D.
Jesús Cuenca-Pardo, M.D.

Guadalajara, Jalisco, México; and Bucaramanga and Bogotá, Colombia

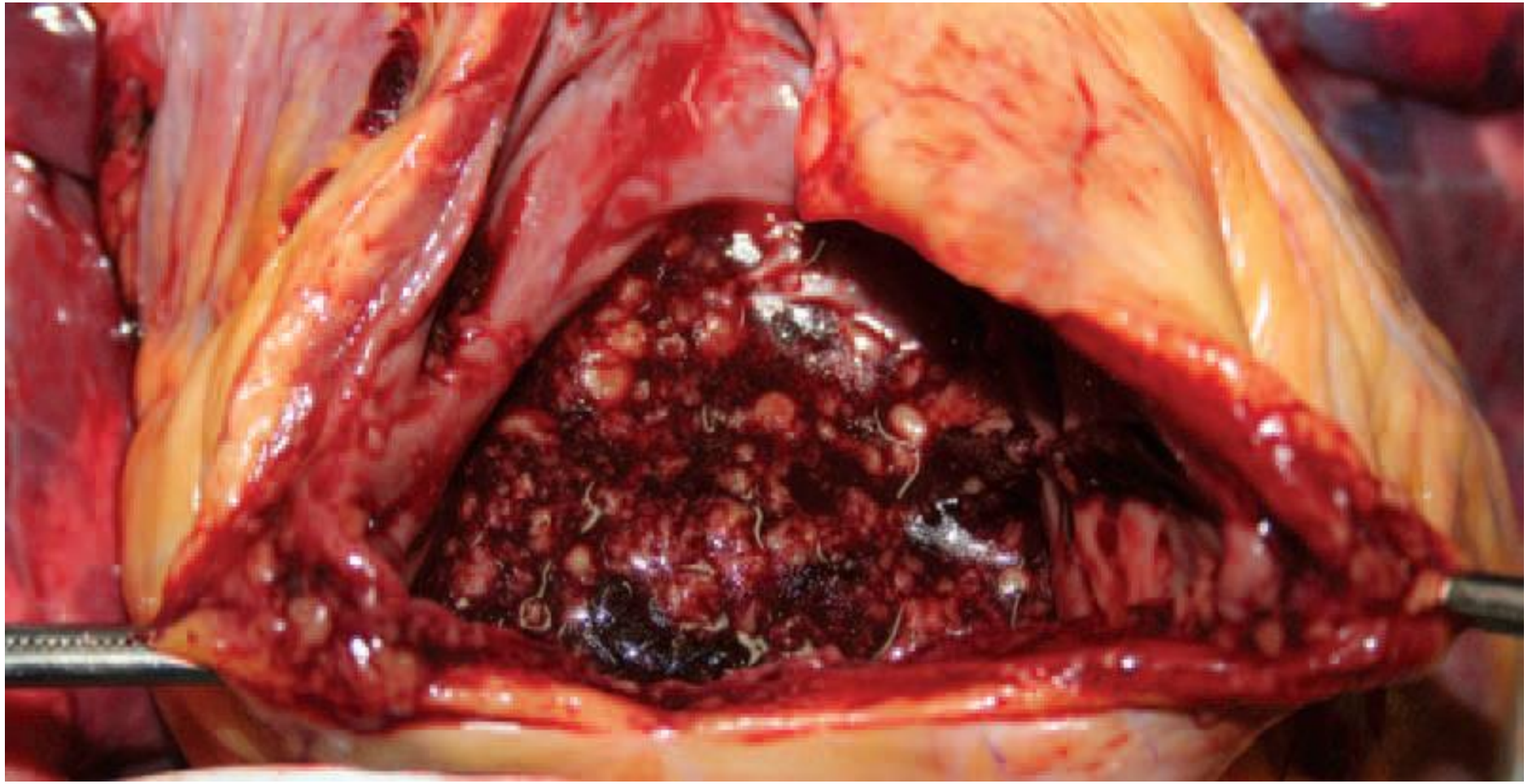
Background: Intramuscular gluteal lipoinjection has become one of the most commonly used surgical procedures for achieving improvement in the gluteal contour; however, there are few studies that report and analyze the causes of secondary death from this surgical procedure.
Methods: An analysis of secondary deaths from gluteal lipoinjection procedures was performed in Mexico and Colombia over periods of 10 and 15 years, respectively. In Mexico, the study was performed through a survey of all members of the Mexican Association of Reconstructive, Plastic and Aesthetic

Fat in Gluteus Maximus Muscle – Common Finding

Macroscopic Fat in Vena Cava – Intraoperative Death

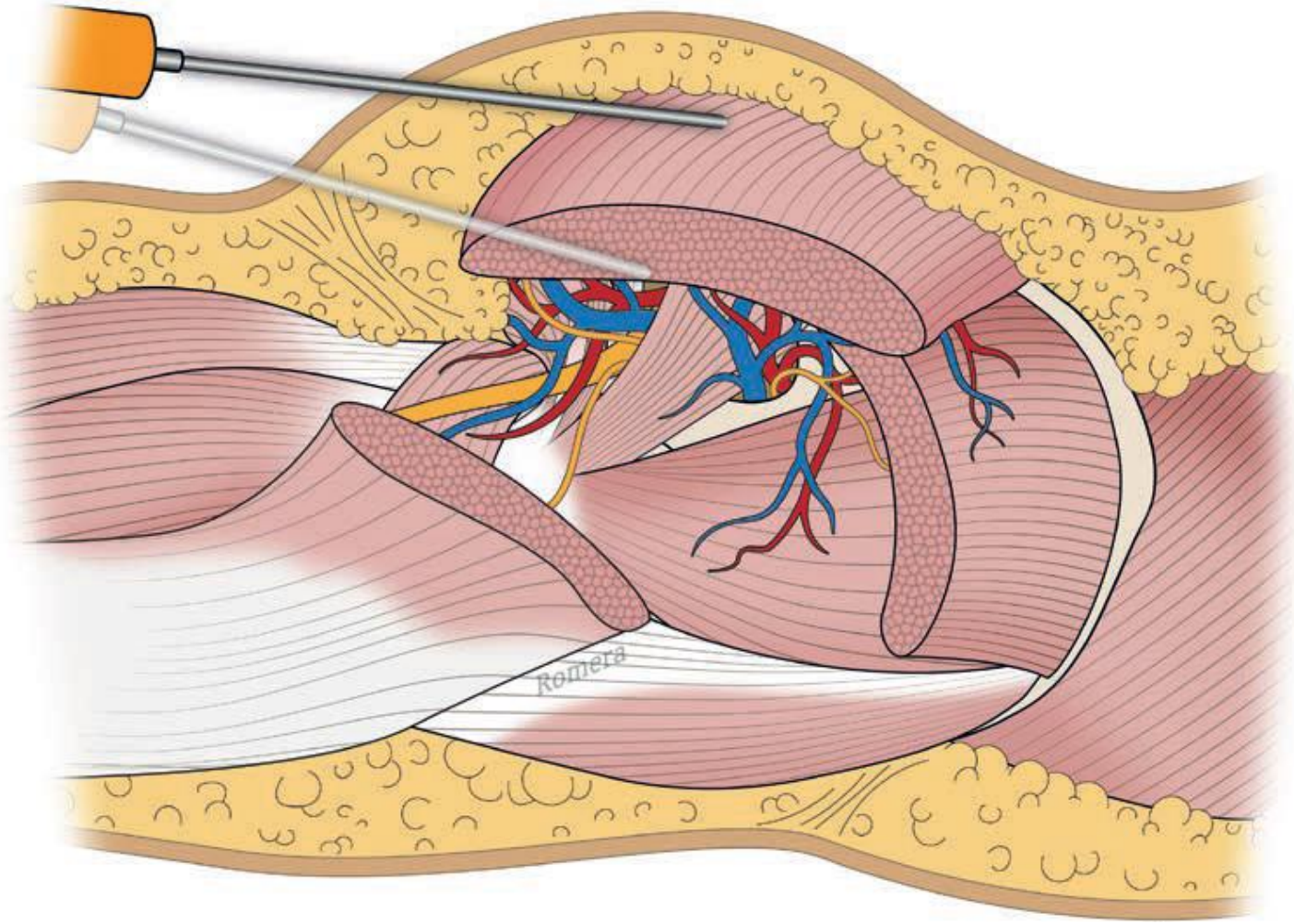


Macroscopic Fat in Right Atrium – Intraoperative Death



Macroscopic Fat in Lung – Intraoperative Death

Solution: Don’t Injection Into Muscles



Was Gluteal Injection Ever Recommended?

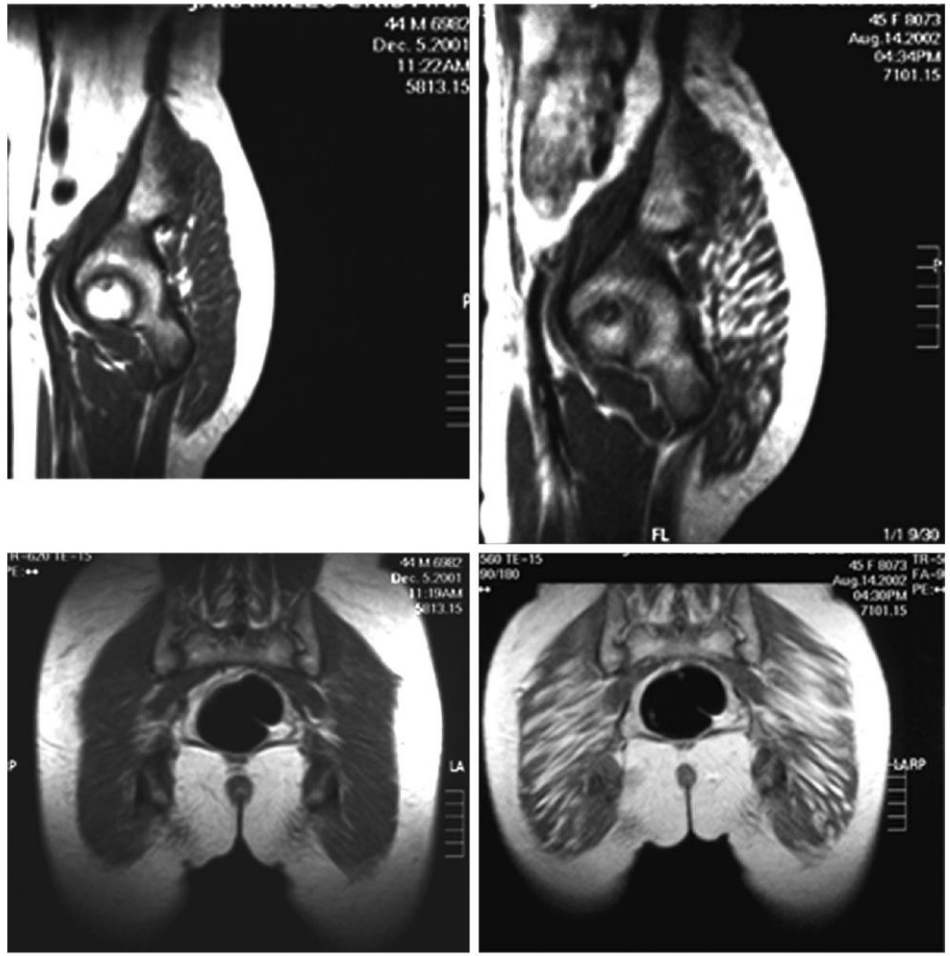
Techniques in
Cosmetic Surgery

Buttock Augmentation: Case Studies of Fat Injection Monitored by Magnetic Resonance Imaging

William L. Murillo, M.D.

New Orleans, La.; and Cali, Colombia

- 162 patients reported in 2004
- "…fat is infiltrated into upper gluteal muscle layer…"
- MRI at 4 and 12 months



Systematic Review of 4015 Cases

- 46% - Both subcutaneous & intramuscular
- 27% - Intramuscular only
- 20% - Subcutaneous only
- 7% - Subcutaneous & subfascial

COSMETIC

Fat Grafting for Gluteal Augmentation: A Systematic Review of the Literature and Meta-Analysis

2016

Alexandra Condé-Green, M.D.
Vasanth Kotamarti, B.S.
Kevin T. Nini, M.D.
Philip D. Wey, M.D.
Naveen K. Ahuja, M.D.
Mark S. Granick, M.D.
Edward S. Lee, M.D.
Newark and New Brunswick, N.J.

Background: With the increasing demand for gluteal fat augmentation, reports of fatal complications have surfaced. Therefore, the authors proposed to analyze the published techniques and compare different protocols, to identify those of potential concern.
Methods: A systematic review of the literature was performed with a search of 21 terms on the PubMed, MEDLINE, Cochrane, and Scientific Electronic Library Online databases. Nineteen articles meeting our predetermined criteria were analyzed, and data from the different steps of the procedure were classified, allowing evaluation and comparison of techniques. Independent-

Is it Acceptable to Inject Gluteal Muscles?

"Later, we injected deeper toward the gluteal muscle to expand and augment its volume."

Based on current knowledge, and lack of full understanding of gluteal vascular anatomy in relation to superficial landmarks, there is no rational reason to inject the gluteal muscles.

COSMETIC

Gluteoplasty with Autologous Fat Tissue: Experience with 106 Consecutive Cases

2015

Rodrigo G. Rosique, M.D., Ph.D.
Marina J. F. Rosique, M.D., Ph.D.
Carlos Gustavo De Moraes, M.D.

Goiás and São Paulo, Brazil; and New York, N.Y.

Background: The female waist-hip ratio of around 0.7 is reachable through liposuction and gluteal fat grafting. The authors evaluated the reliability of this technique.
Methods: Prospective evaluation was performed of all female patients subjected to gluteoplasty with autologous fat tissue between July of 2010 and July of 2013 without a weight change greater than 10 percent during follow-up. Results were evaluated through photographs. The degree of satisfaction (patient and surgeon) was assessed on a scale of 1 (poor outcome) to 4 (excellent improve-

Is it Acceptable to Inject Gluteal Muscles?

"When grafting into the gluteal musculature, only the superficial region of the muscle is grafted, and fat is distributed in locations far from the gluteal artery and veins."

Based on current knowledge, and lack of full understanding of gluteal vascular anatomy in relation to superficial landmarks, there is no rational reason to inject the gluteal muscles.

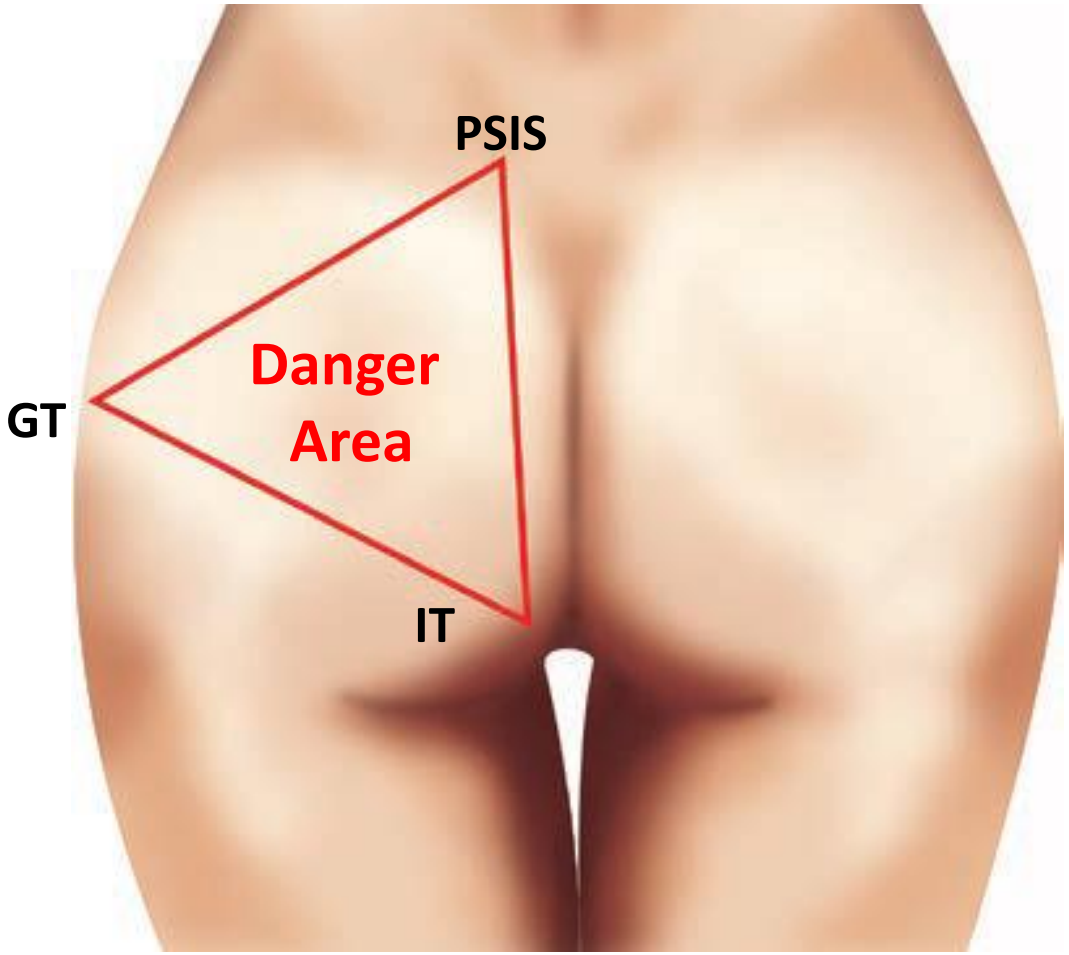
VIDEO+ **2018**

Gluteal Augmentation and Enhancement of the Female Silhouette: Analysis and Technique

Constantino Mendieta, M.D.
James M. Stuzin, M.D.
Miami, Fla.

Summary: Dr. Constantino Mendieta demonstrates and details his personal technique for gluteal augmentation. The video demonstration is divided into three parts: Part I, Aesthetic Analysis and Preoperative Marking; Part II, Creating the Female Silhouette with Circumferential Lipoplasty; and Part III, Autogenous Gluteal Augmentation. Artistic concepts for gluteal augmentation and contouring the female silhouette and technical considerations for patient safety are emphasized. This Master Series Video article is the first in a planned series of video vignettes. (*Plast. Reconstr. Surg.* 141: 306, 2018.)

Stay Safe: Know the Anatomy



"Inject in subcutaneous or superficial muscle and only in subcutaneous plane in triangle of Danger"

Based on current knowledge, and lack of full understanding of gluteal vascular anatomy in relation to superficial landmarks, there is no rational reason to inject the gluteal muscles.

SPECIAL TOPIC

2018

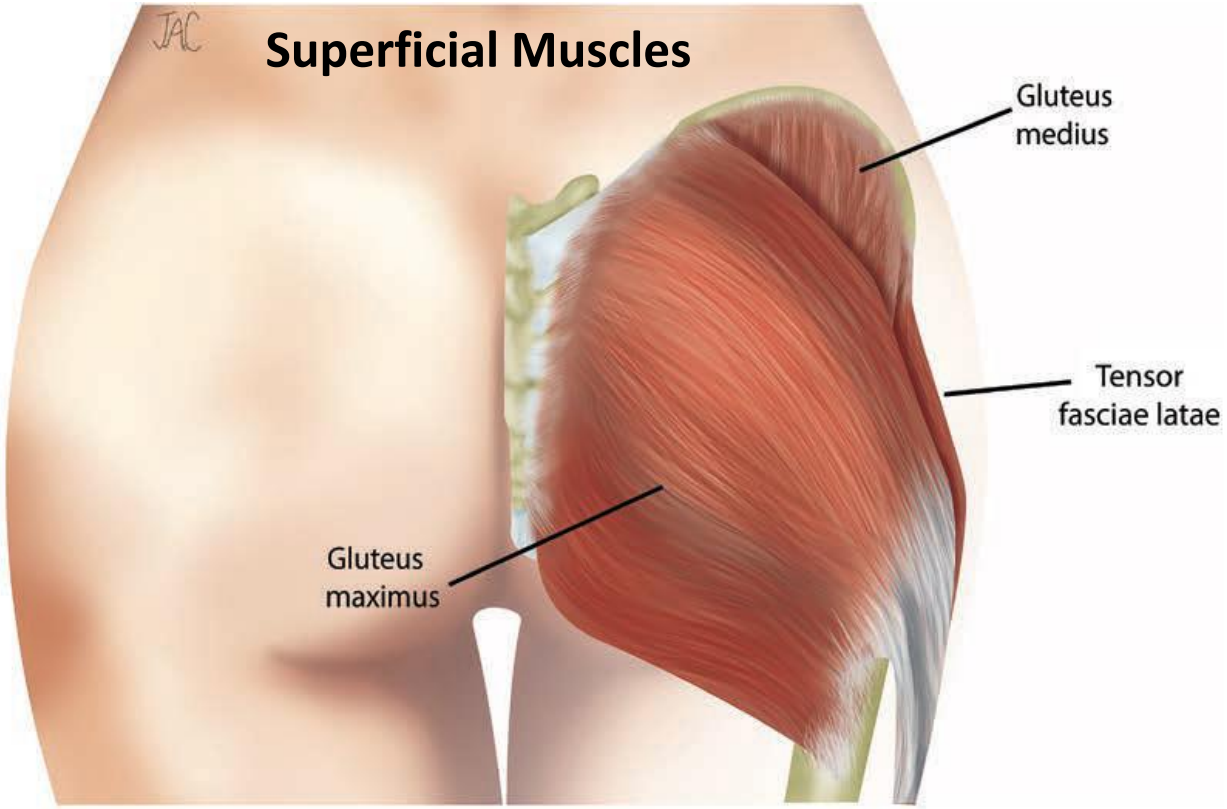
Staying Safe during Gluteal Fat Transplantation

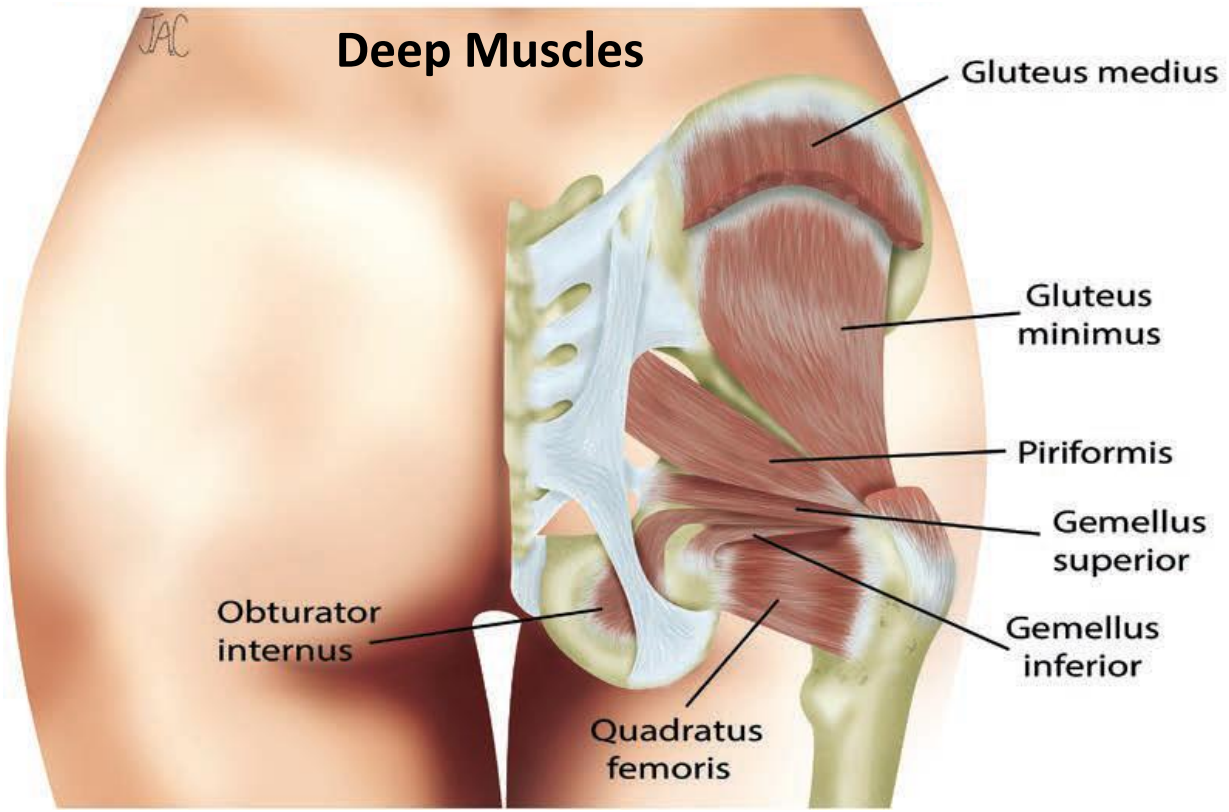
Nathaniel L. Villanueva, M.D.
Daniel A. Del Vecchio, M.D.
Paul N. Afrooz, M.D.
Jourdan A. Carboy, B.S.
Rod J. Rohrich, M.D.

Dallas, Texas; and Boston, Mass.

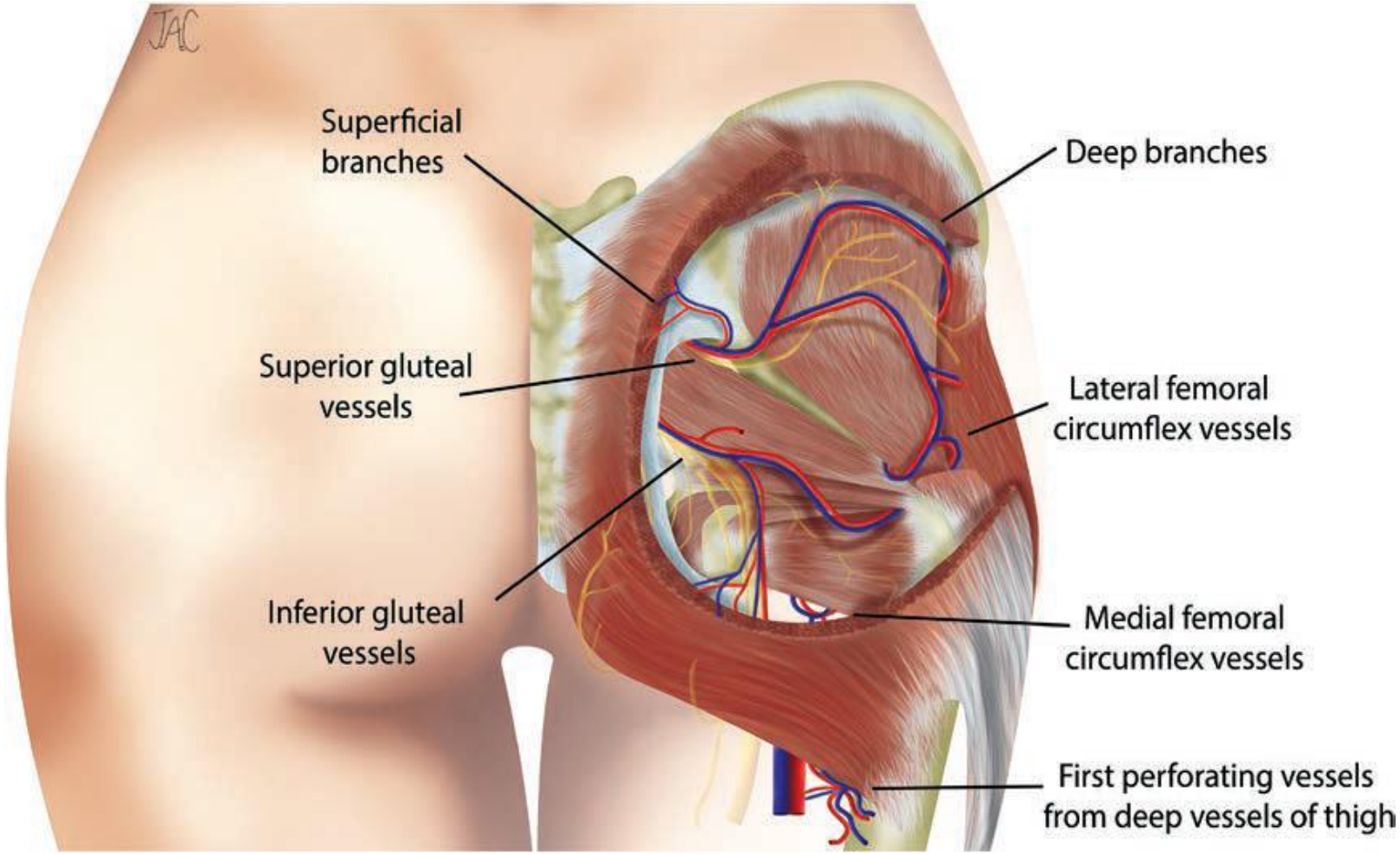
Summary: Gluteal augmentation with fat transplantation is increasing in demand but has been associated with a concerning number of fatality reports. Despite these reports, various surgeons have safely performed gluteal fat transplantation on a large number of patients with no reported mortality. The important aspects of safely performing gluteal fat transplantation are reviewed. Proper patient selection, favorable instrumentation, patient positioning, proper technique, and knowledge of anatomy are critical to improving the safety of this procedure. Adherence to these key principles should allow a reduction in mortality from this procedure, which would safely allow its continued offering in the setting of increasingly high demand. (*Plast. Reconstr. Surg.* 141: 79, 2018.)

Critical Gluteal Anatomy

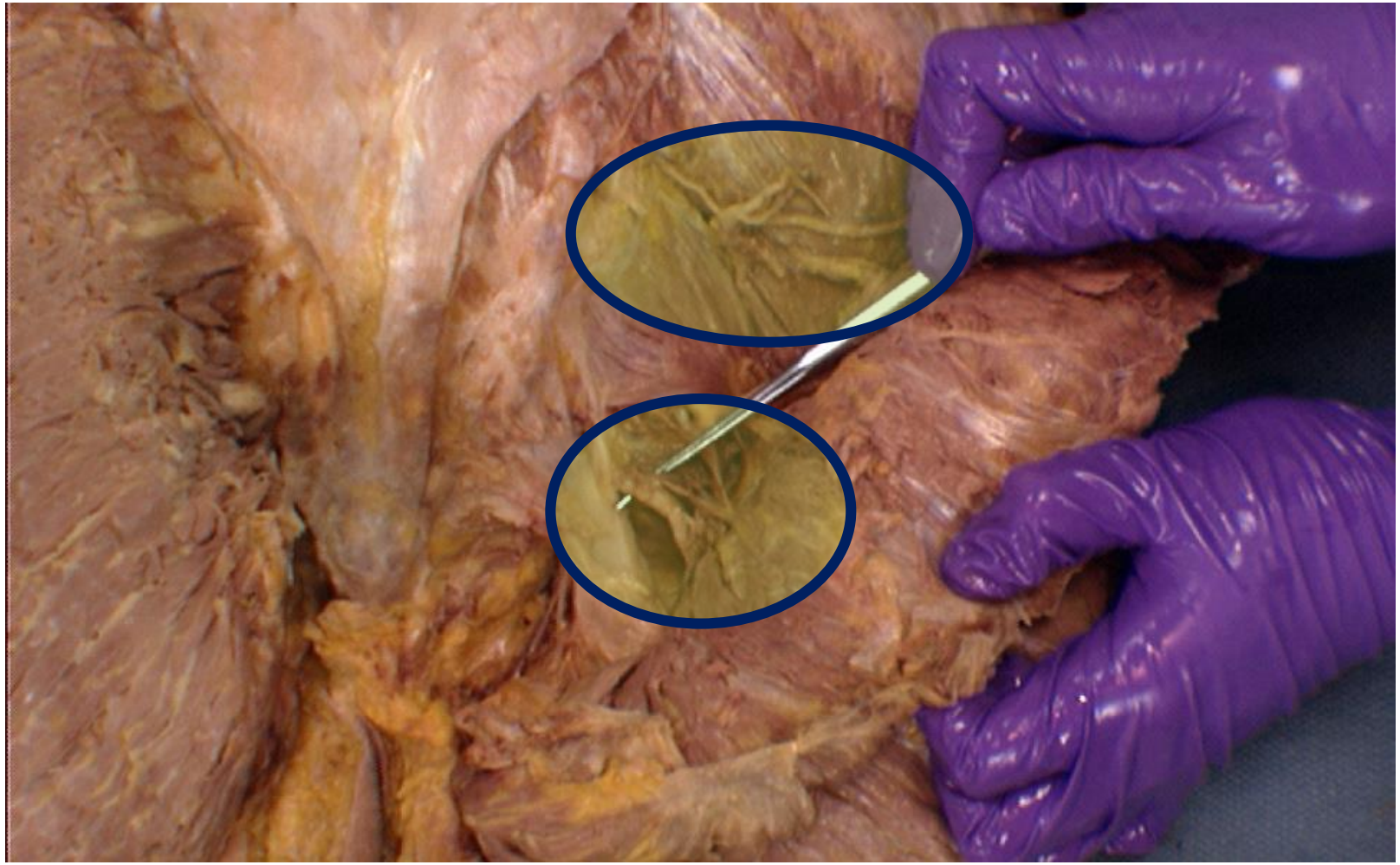




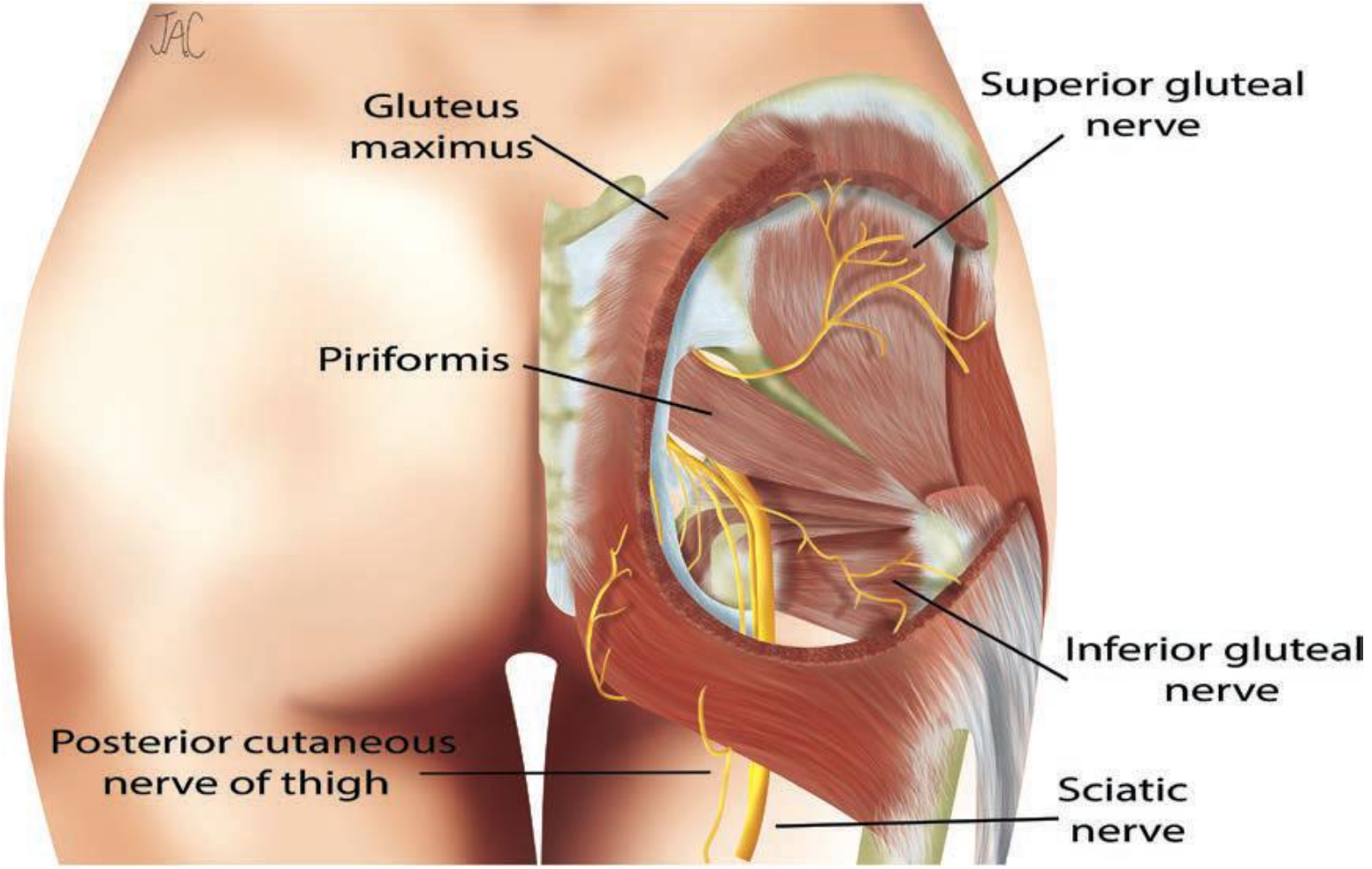
Gluteal Blood Vessels



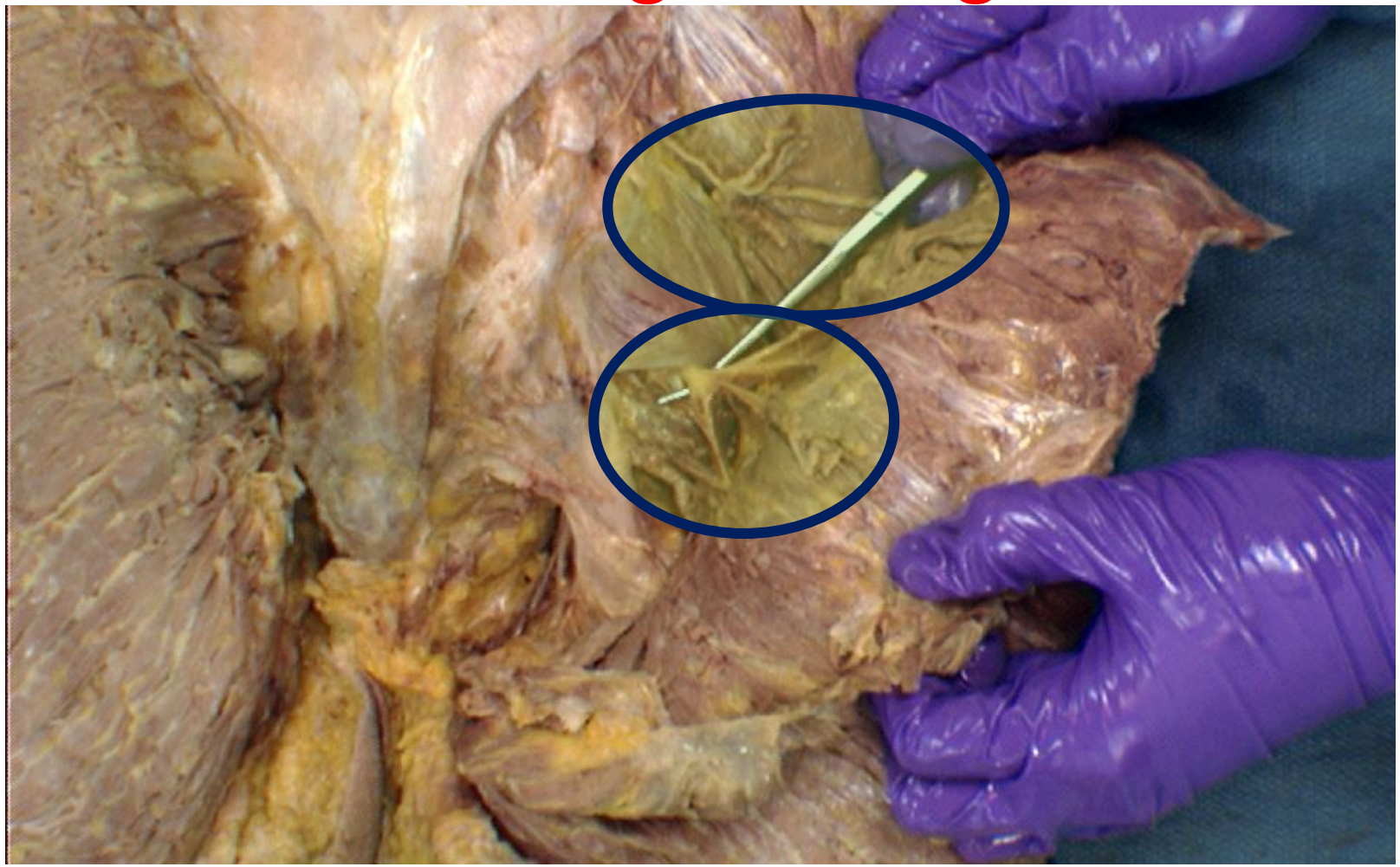
Gluteal Blood Vessels: Large Danger Zone



Gluteal Nerves



Gluteal Nerves: Large Danger Zone



Recommendations

- Inject with large cannulas (blunt, >4 mm)
- Use rigid cannulas
- Continual motion during injection
- Superficial injection
- Avoid excessive graft fill pressure

Expansion Vibration & Curved Cannulas

COSMETIC

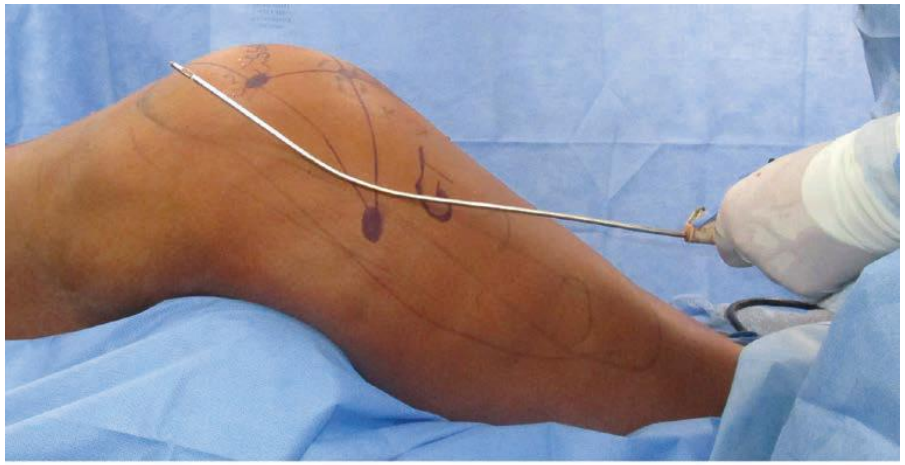
2018

Expansion Vibration Lipofilling: A New Technique in Large-Volume Fat Transplantation

Daniel Del Vecchio, M.D., M.B.A.
Simeon Wall, Jr., M.D.
Boston, Mass.; and Shreveport, La.

Background: Despite rapid growth, gluteal fat transplantation is an operation in search of science and a teachable technique. Long operating times, tedious syringe transfers, inability to shape the recipient site, and the risk of fat embolism all headline as impediments to clinical adoption of the procedure.

- Continuous roller pump fat injection
- Less concentrated fat
- Curved cannulas
- Jack knife position



ASEFR Task Force

Survey of 692 surgeons

- 198,857 gluteal fat grafting cases
- 32 fatal pulmonary fat emboli
- 103 nonfatal pulmonary fat emboli
- 3% had a patient fatality
- 7% had ≥1 pulmonary fat embolism
- Injecting into deep muscle significantly increased incidence of
  - Fatal pulmonary fat emboli
  - Nonfatal pulmonary fat emboli

Body Contouring

Report on Mortality from Gluteal Fat Grafting: Recommendations from the ASERF Task Force

2017

M. Mark Mofid, MD, FACS; Steven Teitelbaum, MD, FACS; Daniel Suissa, MD, MSc, FRCSC; Arturo Ramirez-Montañana, MD; Denis C. Astarita, MD; Constantino Mendieta, MD, FACS; and Robert Singer, MD, FACS

Recommendations

Body Contouring

Report on Mortality from Gluteal Fat Grafting: Recommendations from the ASERF Task Force

2017

M. Mark Mofid, MD, FACS; Steven Teitelbaum, MD, FACS; Daniel Suissa, MD, MSc, FRCSC; Arturo Ramirez-Montañana, MD; Denis C. Astarita, MD; Constantino Mendieta, MD, FACS; and Robert Singer, MD, FACS

- Don’t inject into deep muscle (any muscle)
- Use ≥4 mm single hole injection cannula
- Avoid downward angulation of cannula
- Position patient & incisions to avoid deep muscle injections
- Maintain constant 3-dimensional awareness of cannula tip
- Only inject when cannula is in motion
- Consider pulmonary fat embolism in unstable patients
- Review gluteal vascular anatomy
- Include fat embolism & alternatives in informed consent process

Multi-Society Task Force Recommendations

- Proper patient expectations
- Discuss alternatives, complications, & informed consent
- Consider staged procedures
- **Do NOT place fat in the muscle – subcutaneous space only**
  - Easy to unintentionally enter the muscle during injection
  - Stay mentally focused and aware of the cannula tip at every moment
  - Consider positioning for favor superficial approaches (table jackknife)
  - Use cannulas that are resistant to bending during injection

Multi-Society Task Force Recommendations

- No published series of BBLs done with intramuscular injections is large enough to demonstrate it can be done without the risk of fat embolism
- Subcutaneous plane has not been linked to pulmonary fat embolism
- The Task Force is actively performing anatomic studies and more specific technical guidelines will be forthcoming
  - Correlate deep and topographical anatomy
  - Define danger zones
  - Understand the mechanism of embolization

Recommended Technique

- Stay away from gluteal veins & sciatic nerve
- Inject fat only into subcutaneous space
- Concentrate on position of cannula tip throughout every stroke
  - Particularly in the medial half of the buttock overlying critical structures
- Access incisions best for superficial trajectory of cannula
- Palpate with non-dominant hand to assure cannula tip is superficial
- Use instruments that control the cannula
  - Avoid bendable cannulas
- Injection while cannula is in motion to avoid high-pressure bolus injection

PSF, ASERF, ISAPS Research

- Principal Investigator: Peter Rubin MD
- PSF, ASERF, and ISAPS funded cadaver study
  - Correlate deep and topographical anatomy
  - Define danger zones
  - Understand the mechanism of embolization
  - Relationship between danger zones and gluteal fat transfer technique
- Study performed July 14-15 and August 18-19 in Miami
- Anticipate results in late 2018

General Registry of Autologous Fat Transfer (GRAFT)

- Launched in 2015, the GRAFT Registry uses web-based data collection to capture procedural and outcomes information on fat grafting procedures performed to all areas of the body. Since the registry launched:
  - More than 11,000 patient visits, including procedure and follow-up, have been captured
  - Data has been collected on 785 Fat Grafting to the Buttock procedures, with a complication rate of just over 3%.

General Registry of Autologous Fat Transfer (GRAFT)

- GRAFT has just opened in Brazil and Canada—the first of any of the ASPS/PSF registries to expand internationally.
- Benchmark reports available for practices to compare their performance to the Registry aggregate
- GRAFT app available for download to speed up data entry!
- Learn more today at www.plasticsurgery.org/registries

Support provided by Allergan

If You Have A Death

- Contact Plastic Surgery Foundation immediate
  - Keith Hume at **khume@plasticsurgery.org**
- Task Force members have assisted at autopsies

Stay Safe and Say No to “Hip Dips”

Update on Gluteal Fat Grafting Safety

Karol A Gutowski, MD, FACS

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For Physicians

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