



# Population Assessment of Anatomic Eligibility for Robotic-Assisted DIEP Flap

Mount  
Sinai

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## 1. BACKGROUND

- The traditional open approach to deep inferior epigastric perforator (DIEP) flap reconstruction, the workhorse of autologous breast reconstruction, requires substantial fascial incisions, carrying risks of hernia, bulge, and chronic pain
- Compared to the open approach, robotic-assisted DIEP (R-DIEP) reduces fascial incision length, potentially minimizing postoperative pain, hospital stay and abdominal wall morbidity
- Short intramuscular course and sufficient perforator diameter are generally accepted as important criterion for R-DIEP candidates
- The proportion of patients with suitable anatomy for R-DIEP has not been systematically assessed.

## 2. OBJECTIVE

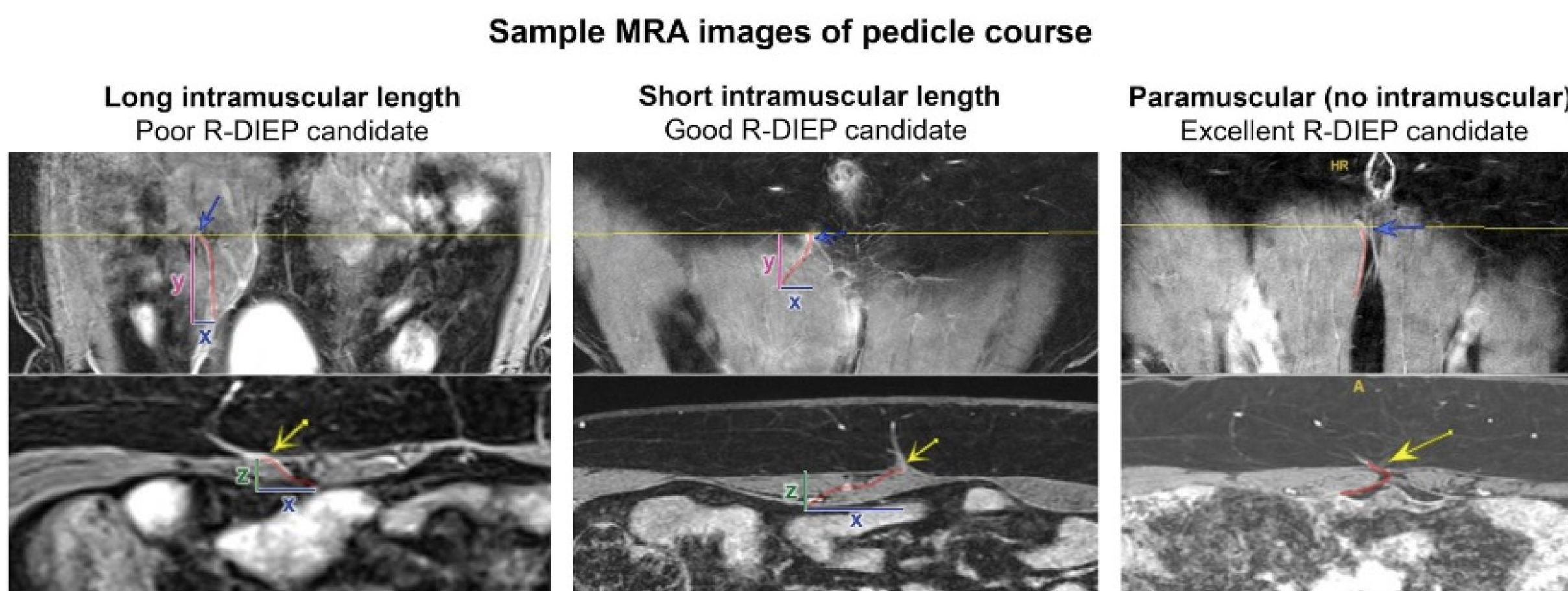
**To determine what percentage of the population has favorable anatomy for R-DIEP flap breast reconstruction**

## 3. METHODS

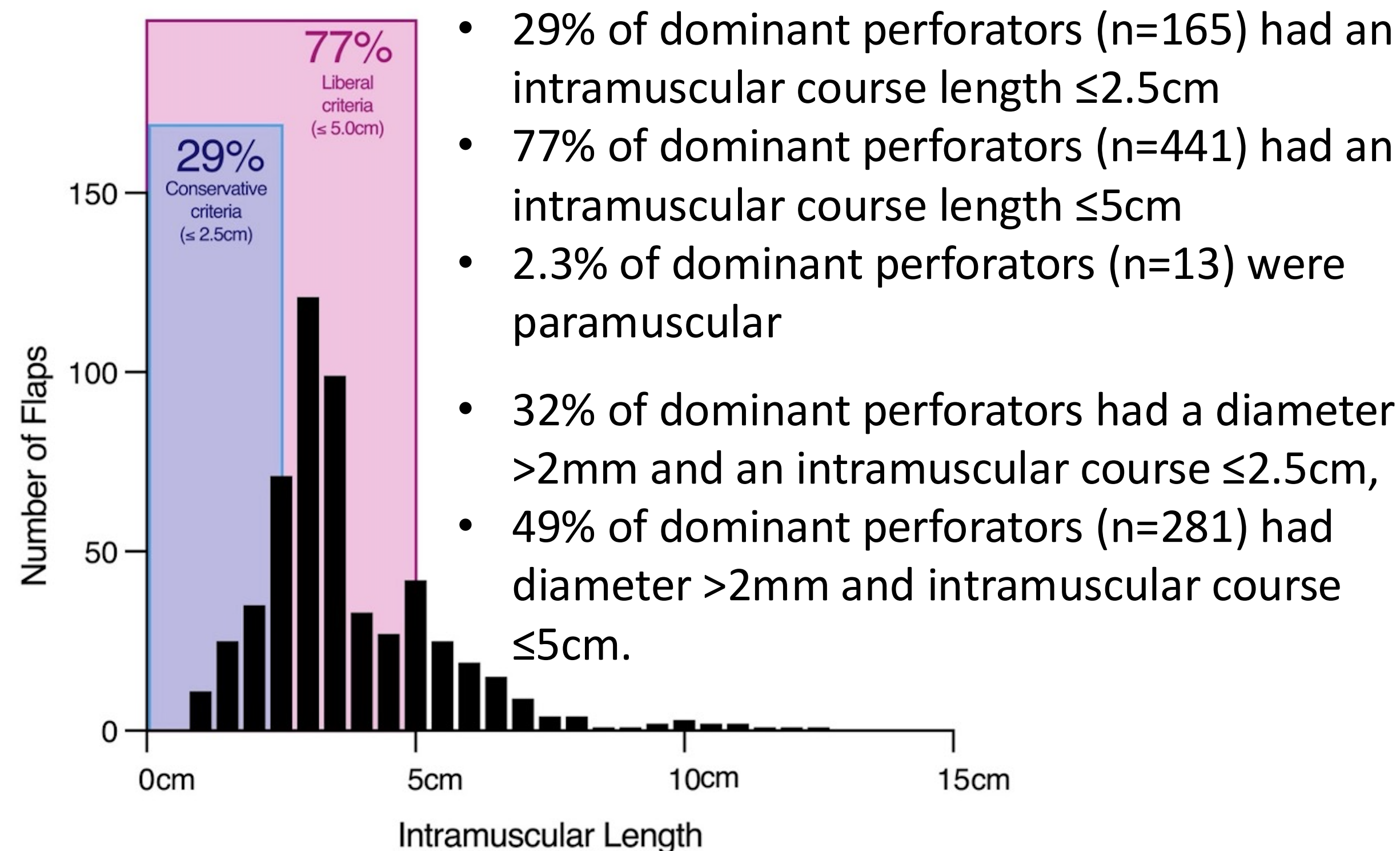
- Identified the largest perforator at or below the level of the umbilicus (i.e. dominant perforator or DP) bilaterally on pre-operative magnetic resonance angiography of DIEP flap patients
- Measured DP diameters at the level of the anterior rectus sheath
- Approximated DP intramuscular (IM) course length by calculating the hypotenuse of a three-dimensional prism created between the entry and exit point relative to the rectus abdominis muscle
- Used conservative ( $\leq 2.5$ cm IM course), and liberal ( $\leq 5$ cm IM course) criterion to stratify patients; used DP diameter  $\geq 2$ mm for subgroup analyses

## 4. RESULTS

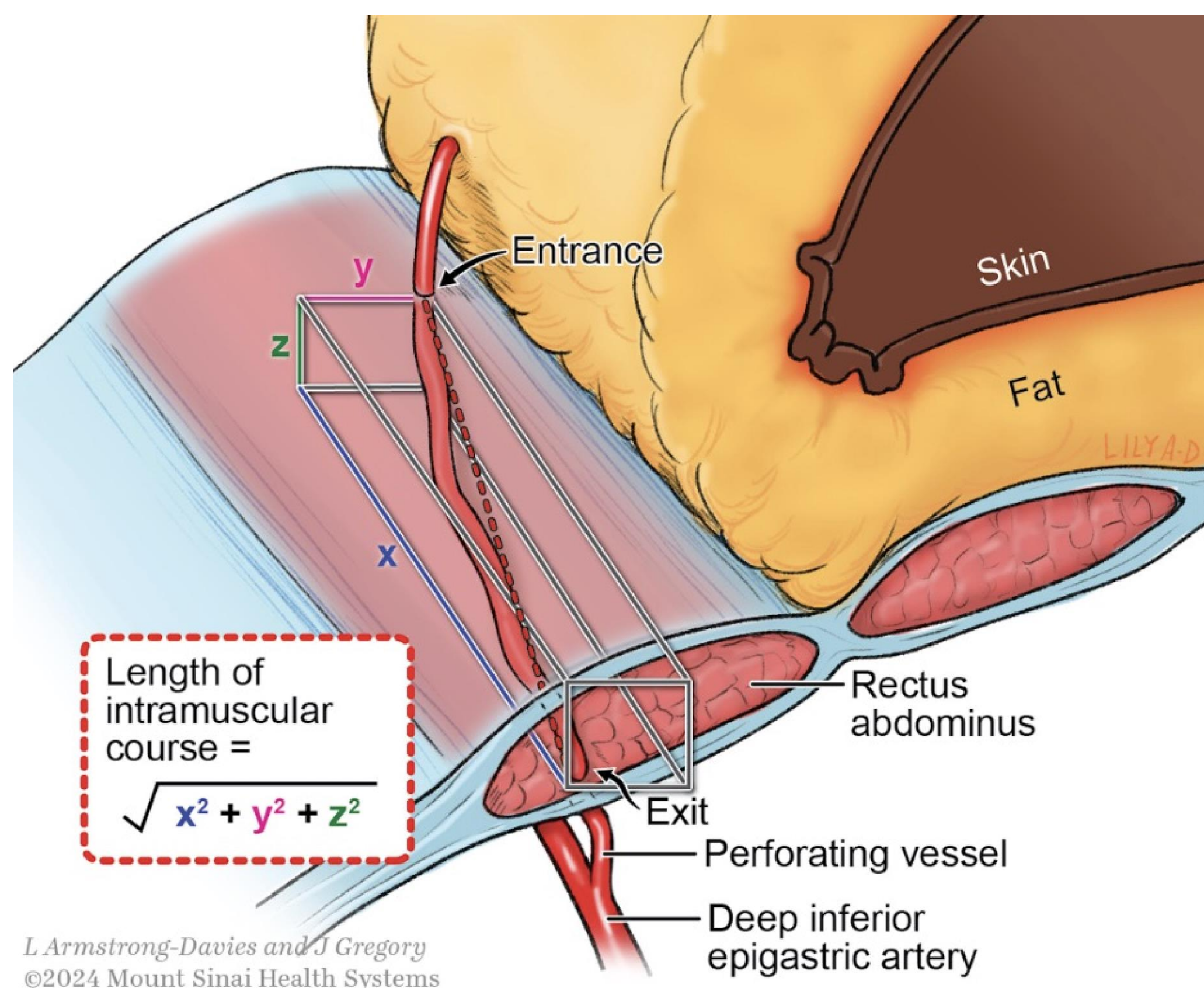
A total of **574 dominant perforators** were evaluated in **287 patients**.



### Distribution of Flaps Amenable to R-DIEP



- 29% of dominant perforators (n=165) had an intramuscular course length  $\leq 2.5$ cm
- 77% of dominant perforators (n=441) had an intramuscular course length  $\leq 5$ cm
- 2.3% of dominant perforators (n=13) were paramuscular
- 32% of dominant perforators had a diameter  $> 2$ mm and an intramuscular course  $\leq 2.5$ cm,
- 49% of dominant perforators (n=281) had diameter  $> 2$ mm and intramuscular course  $\leq 5$ cm.
- 46% of patients had at least one dominant perforator with an intramuscular course  $\leq 2.5$ cm
- 93% of patients had at least one dominant perforator with an intramuscular course  $\leq 5$ cm
- 68% of patients had perforators  $> 2$  mm in diameter and intramuscular lengths  $\leq 5$  cm
- 55% met the more conservative criteria of perforator lengths of  $\leq 2.5$  cm.



### Multivariate regression analysis of age, race, and height on perforator intramuscular length

|                       | Summary                | Standardized beta | P-value |
|-----------------------|------------------------|-------------------|---------|
| Age: mean $\pm$ SD    | 51.3 $\pm$ 9.0 years   | -0.141            | 0.32    |
| Race                  |                        | 0.053             | 0.71    |
| White: n (%)          | 81 (28.2%)             | -                 | -       |
| Black: n (%)          | 68 (23.7%)             | -                 | -       |
| Asian: n (%)          | 54 (18.8%)             | -                 | -       |
| Other: n (%)          | 84 (29.3%)             | -                 | -       |
| Height: mean $\pm$ SD | 1.61 $\pm$ 0.07 meters | 0.251             | 0.08    |

- Age and race did not significantly predict intramuscular course length, while height trended toward significance

|                                            | By perforator (n=574) | By patient (n=287) |
|--------------------------------------------|-----------------------|--------------------|
| Diameter $> 2$ mm - % (n)                  | 65.0% (373)           | 78.4% (225)        |
| Intramuscular course                       |                       |                    |
| <2.5cm - % (n)                             | 28.7% (165)           | 46.0% (132)        |
| <5cm - % (n)                               | 76.8% (441)           | 93.4% (268)        |
| Diameter $> 2$ mm AND intramuscular course |                       |                    |
| <2.5cm - % (n)                             | 32.2% (185)           | 54.7% (157)        |
| <5cm - % (n)                               | 49.0% (281)           | 68.3% (196)        |
| Paramuscular - % (n)                       | 2.3% (13)             | 4.2% (12)          |

## 5. CONCLUSION

**A significant portion of patients are anatomically eligible for R-DIEP, particularly when using liberal criterion**

## 6. CLINICAL RELEVANCE

- Largest study to systematically assess the proportion of patients with suitable anatomy for R-DIEP
- Use of conservative and liberal criteria with standard preoperative imaging enables replicable eligibility assessment using routine clinical data
- Identifying a reliably eligible population justifies the significant financial and training costs associated with R-DIEP adoption
- Future research should use estimated eligible population to perform a cost-benefit analysis, linking eligibility to downstream savings and reduced patient morbidity
- Limitations
  - Linear measurements used for perforator lengths did not account for tortuosity, possibly overestimating eligibility
  - Focused only on anatomical factors; did not account for patient comorbidities or surgeon proficiency
  - Extra-muscular vessel length, a key factor in operational benefit, was not separately analyzed