

A Review and Measurement Study of the Central Mound Pedicle for Breast Reduction

Eric Swanson, MD

Background: The central mound approach to breast reduction has been the subject of recent interest in the literature. However, quantitative evaluation using measurements is lacking. This review was undertaken to objectively evaluate changes in breast dimensions, and to compare the results to a popular alternative method, vertical mammoplasty.

Methods: An electronic search was performed using PubMed to identify all publications endorsing the central mound technique. Published lateral photographs were matched for size and orientation, with computer assistance. Measurements included breast projection, upper pole projection, lower pole level, breast mound elevation, nipple level, and breast parenchymal ratio. Results were compared with published measurement data for the vertical technique.

Results: Twenty-three manuscripts were identified. Ten included photographs suitable for analysis. On average, breast projection decreased 1.1 cm after central mound breast reduction ($P < 0.05$). Upper pole projection dropped 0.4 cm (not significant). The lower pole level was raised 2.6 cm ($P < 0.05$). The nipple level was over-elevated 0.6 cm, on average. The breast parenchymal ratio increased by 0.54. A central mound dissection decreased breast projection. In contrast, publications using a vertical breast reduction demonstrated maintenance of upper pole and breast projection and a modest (<1 cm) increase.

Conclusions: For each measurement comparison, the vertical method outperforms the central mound. Because of its anatomy and geometry, measurements show that the vertical method for breast reduction is more favorable than a central mound dissection. This method can also be used safely for secondary breast reductions. (*Plast Reconstr Surg Glob Open* 2021;9:e3615; doi: [10.1097/GOX.0000000000003615](https://doi.org/10.1097/GOX.0000000000003615); Published online 7 June 2021.)

INTRODUCTION

When performing a breast reduction, the plastic surgeon is faced with a variety of dissections from which to choose. The nipple-areola complex may be contained on a pedicle based inferiorly, superiorly, medially, or (rarely) laterally.¹ Another method bases the nipple-areola complex on a central mound, without any superficial connections. This technique has been promoted in recent publications.²⁻⁴ It has also been recommended for re-reduction cases.⁴

This review critically examines the central mound method, using photographic measurements. This method is compared with the vertical breast reduction, which is a popular alternative technique.¹

From the Swanson Center, Leawood, Kans.

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METHODS

An electronic literature review was performed to identify publications that include central mound breast reductions. The search terms “central mound breast reduction” and “central pedicle breast reduction” were entered into the PubMed search engine. The search included all articles published in English through December 2020. Articles referencing a central mound mastopexy were included. Additional selected manuscripts discussing this surgical approach without these key words in the title were also reviewed. Institutional review board approval was not required because only publications, not patients, were evaluated.

This measurement study evaluated changes in desirable breast characteristics, including upper pole projection, breast projection, lower pole elevation, and the breast parenchymal ratio (the ratio of upper breast area to lower breast area on lateral images). Breast mound elevation was also measured, representing the vertical change in level of the most projecting point on the breast.¹

In many cases, no lateral photographs were published. Lateral photographs are essential when comparing

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relevant breast characteristics such as breast projection, upper pole projection, lower pole elevation, and nipple level.¹ The Canfield 7.4.1 Mirror imaging software (Canfield Scientific, Fairfield, N.J.) was used to match photographs for size and orientation (Figs. 1–3).

Statistical Analysis

Statistical analyses were conducted using IBM SPSS for Mac version 26.0 (SPSS, IBM Corp. Armonk, N.Y.). Paired *t* tests were used to compare preoperative and postoperative measurements. *P* < 0.05 was considered significant.

RESULTS

Twenty-three manuscripts describing a central mound dissection were identified,^{2–24} beginning with a publication by Bames in 1950.⁵ No randomized trials or prospective studies have been published. Because of the heterogeneity of the data and lack of controlled or comparative studies, a meta-analysis was impossible. This review did not assess

fat grafting as an adjunctive treatment; none of the references incorporated this treatment.

Only 1 comparative review of published methods with measurements was identified.¹ Ten articles included lateral photographs that were suitable for analysis.^{2–4,7,9,13,17,19–21} The mean patient age was 30 years, follow-up time 2.1 years, and resection weight 516g.

Photographs from a recent publication of this technique (Fig. 1) are compared with an example of vertical breast reduction performed by the author, using a medial pedicle, matched for resection weight (Fig. 2). Published photographs depicting a re-reduction are also presented (Fig. 3).

On average, breast projection decreased 1.1 cm after a central mound breast reduction (*P* < 0.05). Upper pole projection dropped 0.4 cm (not significant). The lower pole level was raised 2.6 cm (*P* < 0.05). Postoperatively, the nipple level was located 0.6 cm above the apex of the breast, on average. The breast parenchymal ratio increased by 0.54, on average (Table 1).

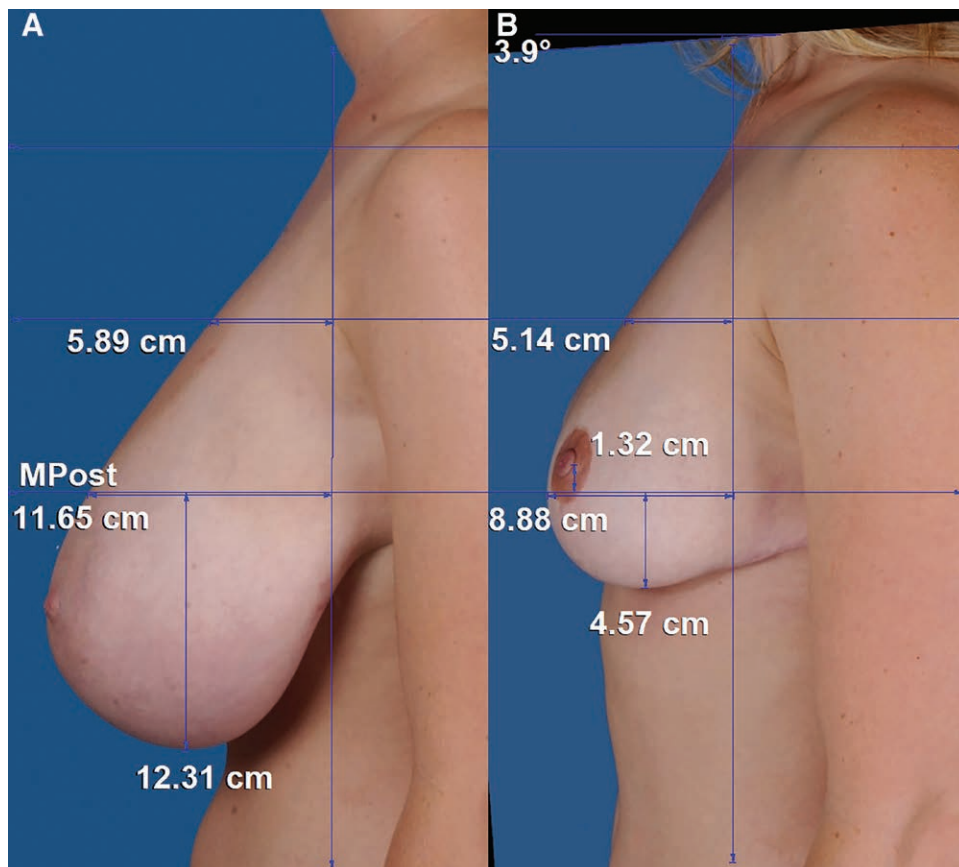


Fig. 1. This patient is shown before (A) and 1 year after (B) undergoing a breast reduction using a central mound pedicle technique. The resection weight was 814 g from the left breast. The patient reportedly lost weight after surgery. Photographs have been matched for size and orientation using the Canfield 7.4.1 Mirror imaging software (Canfield Scientific, Fairfield, N.J.), correcting a 3.9-degree backward tilt of the original postoperative photograph. Breast projection is reduced by 2.8 cm and upper pole projection is reduced by 0.8 cm. The nipple is 1.3 cm over-elevated, and laterally displaced. A 32-cm upper arm length was used for calibration. *MPost*, plane of maximum postoperative breast projection. Reproduced with permission from *Plast Reconstr Surg.* 2020;146:725–733.

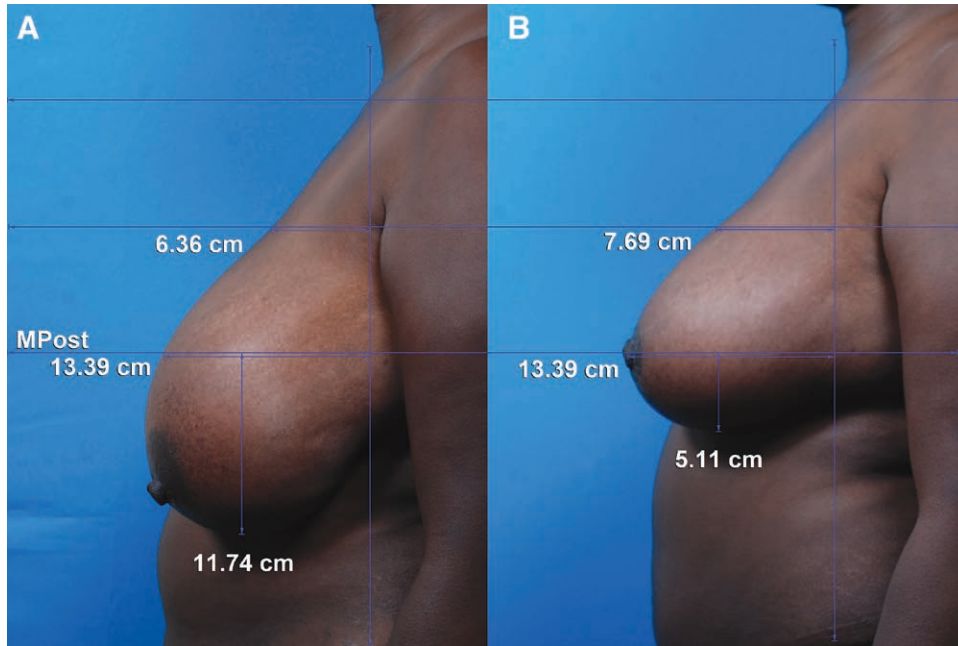


Fig. 2. This 37-year-old woman is shown before (A) and 1 year after (B) undergoing a vertical breast reduction with a medial pedicle performed by the author. She had a simultaneous abdominoplasty. The left resection weight was 800 g. Photographs have been matched for size and orientation using the Canfield 7.4.1 Mirror imaging software. Breast projection is unchanged after surgery. The upper pole projection is increased by 1.3 cm. The nipple is positioned at the level of maximum breast projection (B). *MPost*, plane of maximum postoperative breast projection.

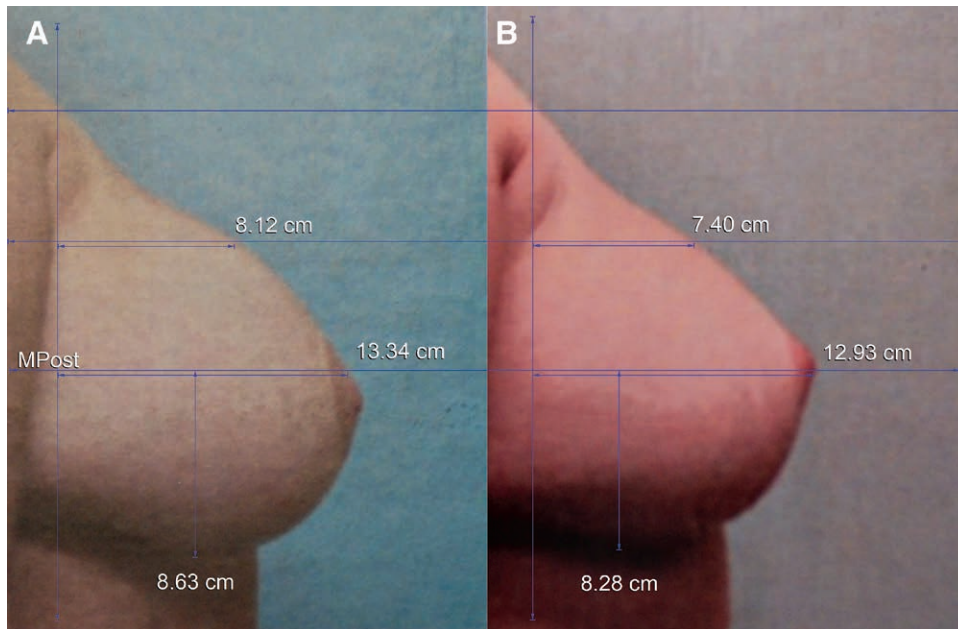


Fig. 3. This 38-year-old woman underwent a secondary central mound breast reduction. Her preoperative (A) and postoperative lateral photographs (B) have been matched for size and orientation using the Canfield 7.4.1 Mirror imaging software. A 32-cm upper arm length is used for calibration. There is a slight loss of upper pole projection and breast projection. The lower pole level is elevated 0.35 cm. *MPost*, plane of maximum postoperative breast projection. Reproduced with permission from *J Plast Surg Hand Surg.* 2019;53:105–110.

Table 1. Difference in Mean Breast Measurements after Central Mound Breast Reduction in 10 Publications

Measurement	Preoperative (SD)	Postoperative (SD)	Difference *	P†
Breast projection (cm)	10.84 (1.80)	9.72 (1.96)	-1.12	<0.05
Upper pole projection (cm)	5.42 (1.87)	5.04 (1.61)	-0.38	NS
Lower pole level (cm)	7.78 (1.79)	5.89 (1.19)	-1.89	<0.05
Breast mound elevation (cm)	0	1.97 (1.93)	1.97	= 0.01
Nipple level (cm)	2.08 (2.02)	-0.55 (0.75)	-2.63	<0.01
Breast parenchymal ratio	1.24 (0.53)	1.78 (0.44)	0.54	<0.01

*Negative values indicate elevation for lower pole level and nipple level.
 †Differences between preoperative and postoperative measurements were compared using paired *t* tests.
 NS, not significant.

Table 2 presents the same measurement data for 35 consecutive women treated with a vertical breast reduction and a medial pedicle by the author.²⁵ The mean resection weight for this patient group (507g) was similar to the central mound group (516g). Unlike the central mound measurements, breast projection and upper pole projection increased significantly ($P < 0.01$ and $P < 0.001$ respectively) after surgery. The breast parenchymal ratio was effectively inverted, from 0.65 to 1.60 ($P < 0.001$).

DISCUSSION

Most mastopexy methods evolved from breast reduction techniques,²⁶ and use similar skin resection patterns and pedicles. A reduction implies a greater amount of parenchymal resection. Many investigators use the more inclusive term “mammoplasty,” to describe both mastopexies and reductions.¹

DeLong et al,³ in their 2020 publication, conclude that a central mound pedicle for breast reduction is relatively safe and effective. The authors list 4 main advantages: extensive skin undermining, a circumferential dissection, an “internal mastopexy” created by glandular or fascial

sutures, and a theoretically reduced risk of scar hypertrophy. The authors recommend a robust comparison with other methods. Indeed, such a comparison is needed. An objective evaluation of this method, and quantitative comparison with the vertical technique is the purpose of this study.

When comparing methods, little useful information is gained by comparing published complication rates because authors differ in how they define a complication.²⁷ Complication rates are an important safety consideration, but do not provide information on changes in breast morphology. Today, breast reduction is regarded as both functional and cosmetic. Aesthetic considerations are of understandably high importance to women who undergo this surgery. To quantitate changes in breast dimensions, the author developed a 2-dimensional measurement system,²⁸ and has used it previously to study published results.¹ Although published photographs cannot be deemed to represent all outcomes, the average result is likely to be no better than the published results.

Terminology is important when comparing methods. The “pedicle” is understood to mean the attachment of the nipple–areola complex. A “flap” refers to breast tissue that does not contain the nipple-areola complex. A central mound flap, or inferiorly-based flap, is not the same as a central mound, or inferiorly-based pedicle. For example, the plastic surgeon may create a central mound flap, but base the nipple-areola complex on a superior pedicle.²⁴

DeLong et al³ believe that a central mound dissection “may limit the likelihood of damage to the sensory cutaneous nerves destined for the nipple–areola complex” and is “maximally vascular.” On the contrary, a central mound isolates the nipple–areola complex on a parenchymal base, sacrificing all superficial vascular and sensory connections.¹ The authors’ surveys indicated a decrease in nipple sensation after surgery ($P < 0.001$).³ Its safety is questionable. The authors reported 2 cases of nipple necrosis (among 227 bilateral and 98 unilateral reductions) and 9 cases of skin necrosis. The authors occasionally resort to nipple grafting.³

In contrast, a vertical reduction with a medial pedicle preserves a parenchymal base to capture deep innervation while maintaining a superficial pedicle to preserve contributions from the 3rd, 4th, and 5th anterior cutaneous sensory nerves, which provide the dominant superficial innervation to the nipple and areola.²⁹ This design also preserves the dominant superficial blood supply to the nipple–areola, which (fortunately) is also based medially.³⁰ Clinical findings confirm these anatomic advantages. Several large series report no cases of nipple necrosis.^{31–33} Skin undermining is avoided, reducing the risk of skin necrosis.^{31–33} Nipple grafting is unnecessary. Despite their continuing appeal, measurements show that fascial sutures are ineffective.^{1,34}

A central mound dissection does not include a lower pole glandular resection, which can cause a persistent bulge of the lower pole.¹ A midline lower pole parenchymal resection creates a vertical ellipse. Closing this ellipse trades width for projection. A circumferential resection³

Table 2. Difference in Mean Right Breast Measurements after Vertical Breast Reduction in 35 Women (Swanson)²⁵

Measurement	Preoperative (SD)	Postoperative (SD)	Difference*	P†
Breast projection (cm)	10.16 (1.59)	10.79 (1.83)	0.63	<0.01
Upper pole projection (cm)	4.86 (1.10)	5.77 (1.27)	0.91	<0.001
Lower pole level (cm)	10.93 (2.01)	5.71 (0.91)	-5.22	<0.001
Breast mound elevation (cm)	0	6.12 (1.64)	6.12	<0.001
Nipple level (cm)	7.12 (1.87)	-0.62 (0.96)	-7.74	<0.001
Breast parenchymal ratio	0.65 (0.21)	1.60 (0.42)	0.95	<0.001

*Negative values indicate elevation for lower pole level and nipple level.
 †Differences between preoperative and postoperative measurements were compared using paired *t* tests.

does not benefit from this favorable change in shape. A Wise pattern trades projection for width.¹ The authors remove a wedge of tissue from the upper pole.³ Not surprisingly, measurements reveal a loss of breast projection and upper pole projection after a central mound dissection (Fig. 1).³ In contrast, a vertical mammoplasty preserves breast projection despite a reduction in breast volume (Fig. 2, Table 2).¹

No data support claims of improved lactation compared to other methods or sustained results with internal mastopexy.³ DeLong et al³ believe that the nipple sits at the point of maximum breast projection. However, their postoperative photograph (Fig. 1) reveals nipple overelevation, a frequent problem when using a Wise pattern.¹ The authors conclude that a central mound may be used safely in cases of re-reduction or after radiation therapy, but do not report any secondary breast reductions or irradiated breasts in their series.³ Secondary reductions may be safely performed using the vertical method without conforming to the original dissection pattern.^{33,35}

DeLong et al³ report 25 hypertrophic scars and 16 scar revisions (4.9%). The horizontal scar of a Wise pattern is prone to hypertrophy,³¹ which is usually a nonissue for a vertical mammoplasty. The only published randomized study finds that patients prefer the aesthetic outcome of a vertical reduction over a Wise pattern.³⁶

The average operating time in the series reported by DeLong et al was 3 hours and 34 minutes.³ Other investigators find the vertical approach more time efficient than the central mound,^{31–33} with minimal blood loss,³¹ making mommy makeovers safer.³³ Importantly, a vertical design is a safe option when implants are inserted simultaneously.^{33,37,38}

In their 2019 publication, Spaniol et al⁴ offer a modified central mound technique as an excellent option for secondary reduction mammoplasty. The authors used this operation in 11 women. They claim that this is the largest retrospective cohort study on secondary reduction mammoplasties,⁴ and that existing studies evaluate very few patients and rarely report postoperative outcomes. In fact, several publications, including series of 25 and 90 re-reduction patients,^{35,39} evaluate the vertical reduction as the method of choice for secondary reduction mammoplasty, regardless of the initial pedicle design, and do report outcomes.^{33,35,39}

In their dissection, Spaniol et al⁴ preserve a central parenchymal base, with circumferential tissue resection. The authors modify the central mound by maintaining superior and inferior deepithelialized pedicles, similar to the McKissock design.⁴⁰ Medial and lateral vascular and sensory connections to the nipple-areola are divided, and the medial and lateral skin flaps are undermined. A superior pedicle can be difficult to inset.³¹ The inferior pedicle remains tethered at the inframammary fold.²⁵ There is little elevation of the breast mound and lower pole level.¹ The vertical bipedicle does not appear to improve breast shape. When the authors' photographs are corrected for size and orientation, there is minimal elevation of the lower pole level. Both upper pole projection and breast projection are slightly reduced (Fig. 3).

A previous study evaluated changes in breast shape in 15 publications of women undergoing vertical mammoplasties using the same measurement method.¹ The mean ages, follow-up time, and resection weights for these women were not significantly different from the reported values for the 10 patients in this study. Patients undergoing vertical reduction demonstrated a 0.13 cm gain in breast projection and a 0.31 cm gain in upper pole projection, on average (changes not significant).¹ Patients undergoing central mound reductions did not show gains but rather losses. On average, these patients lost 1.1 cm of breast projection ($P < 0.05$) and lost 0.4 cm of upper pole projection (not significant). Lower pole elevation averaged 3.3 cm for patients undergoing vertical reduction¹ versus 1.9 cm for central mound reductions (both $P < 0.05$). The breast parenchymal ratio increased by 0.79 after vertical reduction¹ ($P < 0.001$) versus 0.54 for central mound reduction ($P < 0.01$).

The vertical method is (uniquely) capable of preserving and even slightly enhancing (<1 cm) breast projection and upper pole projection.²⁵ A vertical mammoplasty effectively elevates the breast mound and lower pole.^{1,25,41} Although an inferior pedicle may have been used for the original breast reduction, removing lower pole tissue is safe, and necessary to reduce the breast size and improve the shape.^{33,35,39} A vertical breast reduction provides less boxy and more conical breasts than the Wise pattern.⁴¹

Importantly, a vertical mammoplasty can preserve the dominant medially-based superficial nipple-areola innervation and blood supply.⁴¹ The traditional inverted-T (Wise pattern) inferior pedicle breast reduction often creates nipple overelevation (“pseudoptosis”).¹ Therefore, there may be no need to elevate the nipple-areola. A lower pole resection without a peri-areolar component may suffice.^{33,35,39} If nipple-areola elevation is needed, the vertical reduction may be performed with nipple-areola repositioning.^{33,35} A medially-based pedicle to the nipple-areola is preserved.³³ Often it is possible to increase the arc of deepithelialization to include a superior (and even lateral) pedicle, maximizing nipple-areola vascularity.^{33,35,39}

In the author's prospective clinical study, there was no greater risk of complications in secondary mammoplasties compared with primary mammoplasties.³³ The vertical method is inherently safe,^{33,35,39} because a midline resection cannot interfere with medially and laterally based blood supply and sensation.⁴¹ Clinical experience shows that there is no need to replicate the original (often inverted-T, inferior pedicle) design.^{33,35,39} Nipple perfusion is preserved.^{33–35,39} Consequently, there is no need to obtain the original operative note. A vertical reduction with a medially-based pedicle maintains nipple sensation more reliably than other reduction techniques.⁴² The author uses the vertical method exclusively at the time of re-reduction and secondary mastopexy.

A central mound dissection has also been used at the time of insertion of mesh, in an effort to provide an “internal bra.”^{17,43–47} A central mound method is needed to provide a base on which to suture the mesh. However, measurements are not supportive.^{48,49}

CONCLUSIONS

Standardized photographs and measurements are essential when comparing breast reduction techniques.¹ Only by evaluating our results objectively with measurements, patient-reported outcomes, and standardized photographs can we recognize the limitations of existing methods and improve upon them. Evidence-based medicine places little value on “theoretical benefits.”²³ When considering the anatomy,¹ geometry,¹ clinical results,^{31–33} and measurements,^{1,25,41} the evidence shows that a vertical reduction outperforms a central mound dissection.

When considering a secondary mammoplasty, the same considerations for size reduction, shape improvement, breast elevation, and nipple sensation are in place as for a primary reduction. The vertical approach may be used safely for re-reduction.

Dr. Eric Swanson
Swanson Center
11413 Ash St., Leawood
KS 66211

E-mail: eswanson@swansoncenter.com

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