

**AN INSTRUCTIONAL VIDEO TO TEACH THE ANATOMY,
CLASSIFICATION, AND REPAIR OF A FOURTH-DEGREE
PERINEAL LACERATION**

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DEDICATION

I would first like to thank my committee members Lewis Calver and Richard Howdy Jr. for all of their guidance and patience through this project. I would especially like to extend my thanks to Marlene Corton, M.D., my content expert, for her time, patience and positive attitude.

I would also like to give a special word of thanks to Shayzreen Roshanravan M.D., without her this project would not exist.

A special thank you to Anne Murray, Kim Krumwiede, and Tony Frisbie for all of the little things they assisted with throughout this process.

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CLASSIFICATION, AND REPAIR OF A FOURTH-DEGREE
PERINEAL LACERATION**

by

JORDAN TAYLOR PIETZ

THESIS

Presented to the Faculty of the Graduate School of Biomedical Sciences

The University of Texas Southwestern Medical Center at Dallas

In Partial Fulfillment of the Requirements

For the Degree of

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JORDAN TAYLOR PIETZ, M.A.

The University of Texas Southwestern Medical Center at Dallas, 2007

LEWIS E. CALVER, M.S.

The goal of this thesis project was to create an instructional video for first-year obstetrics and gynecology residents to instruct them on the anatomy and procedural steps involved in the layered repair of a fourth-degree laceration. The video combines a wide array of media including illustrations, animations, video, and stills to cover three key points:

a general overview of female pelvic anatomy, a classification of procedural degrees of perineal lacerations and steps for the repair with emphasis on anatomy and surgical principles. This project would be used as a supplemental resource to the textbook and hands-on training. These current resources have been shown to be insufficient for proper comprehension of this information, resulting in improper care of patients.

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CHAPTER ONE

Introduction

Goal

The goal of this thesis project was to create an instructional DVD that would be used by obstetric and gynecology residents to learn three things: a “layer cake” overview of the muscle groups and tissues of the female perineal region, a classification of procedural degrees of perineal lacerations, and steps for the repair of a fourth degree perineal laceration including the episiotomy repair steps, with emphasis on anatomy and surgical principles.

In order to achieve the goal of creating this video a list of objectives had to be met. The first objective of this thesis was to work closely with Marlene M. Corton, M.D., Associate Professor in the Department of Obstetrics and Gynecology at The University of Texas Southwestern Medical Center (UTSW), and Shayzreen M. Roshanravan, M.D. Fellow, Female Pelvic Medicine and Reconstructive Surgery Division, Department of Obstetrics and Gynecology at UTSW, to determine how the final format would be presented, gather materials that already existed, and sift through them to determine what would need to be created. Lastly I worked with them to edit the final DVD. The next objective was to illustrate or create the media that were required for the project. The media that fulfilled the objective included nearly forty related illustrations, three animations,

still photos, narration, and various surgical video clips. The final objective was to edit all of the media together in a comprehensive video presentation that clearly described the process of repairing a fourth-degree laceration using the layered approach method and make it available to OB/GYN residents and allow them to view the video and provide feedback. This feedback would determine if the final video met the goals and objectives laid out for this project.

The original form of this project was a ten minute presented by Dr. Roshanravan at the American Urogyencologic Society (AUGS) convention. The DVD was also submitted to the American Urogynecologic Society (AUGS) along with an abstract for review as a legitimate educational material. It was during this initial production that the style and structure of the project took shape. Many additional illustrations were created for that original project but were unused in the final video of this project. These illustrations proved invaluable in the creation process of some of the illustrations appearing in the final video. For example a large focus of that video was comparing the end to end method of repair with the overlapping method preferred by colorectal surgeons. Only one animation was created for that video, but its creation and integration as an overlay on OR footage paved the way for the development of the two animations found in the final video. Overall the feedback from the AUGS convention was very positive except that one doctor there challenged the depiction of the capsule surrounding the EAS. Upon further

research and consultation with the content experts, the capsule was changed based on the new information. The rest of the illustrations were updated for the final DVD concerned by this paper.

Background

A passing review of the literature indicates that most doctors and midwives lack understanding of the anatomy they are dealing with when repairing lacerations in the perineal region. This is particularly true concerning repair of third and fourth-degree perineal lacerations. The main reason for this deficiency is because there are no tools to thoroughly teach and reinforce the methodology of repair. Most residency training programs just use obstetric textbooks as reference material and implement the “See one, do one, teach one”¹ style of instruction. At present few institutions use training dummies or other similar constructs.² There is currently one resource that is available called *Episiotomy Procedure And Repair Techniques* distributed by the American College of Obstetricians and Gynecologists (ACOG) designed for residents who have little clinical experience. This instructional material does little to prepare residents for repairing third and fourth degree lacerations. By definition, an episiotomy is an intentional second-

¹ Dr. Shayzreen M. Roshanravan, thesis planning meeting, June 2007

² Sparks, R.A., Beesley, A.D., Jones, A.D., (2005) The Sponge Perineum: A Model to Teach Perineal Laceration Repair. Retrieved Novemer, 2007, from <http://www.fmdrl.org/656>

degree laceration, and consequently does not involve the same muscle groups and tissues as a third or fourth degree laceration.

Significance

Currently there are few specific resources, other than the obstetric textbook that outline an anatomic and layer directed approach to the repair of fourth-degree perineal lacerations at Parkland Memorial Hospital in Dallas, Texas. The literature also indicates that this is true in other residency programs locally and internationally. The methodology for teaching OB/GYN residents is that they are directed to a textbook and are subject to the “See one, do one, teach one” mantra of medical education. Fortunately, third and fourth-degree lacerations are uncommon (6-18 percent nationally), but that provides little experience for resident learning the procedure. With the volume of deliveries found at Parkland Memorial Hospital, an unformed resident will probably encounter one of these lacerations but may be unable to correctly identify an occult problem or perform an effective repair. As a result, a patient’s quality of life may suffer because of anal or fecal incontinence. This video will provide an excellent foundation for residents, that when combined with hands-on experience, may improve the quality of life for the patient.

Limitations

This thesis project is limited to level-appropriate information regarding female pelvic anatomy, classification of the four degrees of lacerations, and the layered repair of a fourth-degree perineal laceration. The project is also limited to the final format of a video presented on a DVD.

CHAPTER TWO

Review of Literature

A thorough review of the resources currently in existence was an important objective of this project. Research has revealed that there are currently few existing resources that inform residents how to repair a fourth degree laceration that meet the target audience's needs. Two resources exist, but they are not up to date or are lacking helpful visual media. Therefore, the research approach was broadened to determine what the field had to say about these types of repairs and the state of education regarding them. The result revealed that there is disagreement on the classification systems of lacerations, as well as a passive demonstration that most junior physicians are somewhat undereducated about the perineal body and its repair. The literature showed that a material was needed to provide a good supplement of information for repair training.

Relevant Literature

Anal and fecal incontinence is a serious social problem that inhibits the lifestyles of many women. In particular, anal and fecal incontinence is likely generated as the result of a vaginal birth from a primiparous woman who has had a perineal laceration.^{3, 4} Proper repair of these lacerations has been demonstrated

³ Borello_France, D., Burgio, K. L., Richter, H.E., Zyczynski, H., et al. (2006) Fecal and Urinary Incontinence in Primiparous Women. *Obstet Gynecol*, 108, 863-872

to provide some relief but, “*The long-term outcome after primary repair of sphincter injuries is largely unknown*”⁵. As a result, the issue of perineal lacerations and repair of the anal sphincter muscles has garnered a wide array of papers addressing the issues of repair and their usefulness. The goal of this thesis however is not to add to the debate, but to instruct on what is currently believed to be the best method of repair at this time. It should be mentioned that even after primary repair of the anal sphincter muscles women are reporting relapses of continence. In addition, another technique of anal sphincter repair is in practice by colorectal surgeons. In a paper by A. Sultan, he states that colorectal surgeons who use the *overlapping method* of repair have shown a restoration percentage of 76% as opposed to 50% restoration with the *end-to-end* repair method (as is the primary focus of repair for this thesis project).⁶ Current Follow-up data and the age of this article have demonstrated that there are inconclusive results regarding a comparison of these two methods. Since the target audience for this thesis was OBGYN residents and not colorectal surgeons, it was felt that teaching the end-to-end repair was still the most relevant method.

⁴Fenner, D.E., Genberg, B., Brahma, P., Marek, L., DeLancey, J.O.L. (2003) Fecal and Urinary Incontinence After Vaginal Delivery with Anal Sphincter Disruption in an Obstetrics Unit in the United States. *Am J Obstet Gynecol*, 189, 1543-1549

⁵ Pollack, J., Nordenstam, J., Brismar, S., Lopez, A., et al. (2004) Anal Incontinence After Vaginal Delivery: A Five-Year prospective Cohort Study. *Obstet Gynecol*, 104, 1397-1401

⁶ Sultan, A.H., Monga, A.K., Kumar, D., Stanton, S.L., (1999) Primary Repair of Obstetric Anal Sphincter Rupture Using the Overlap Technique. *Br J Obstet Gynaeco*, 106, 318-323

Since the literature established that anal incontinence is a problem, the next pursuit of the literature review was to explore the relationship of persistent anal incontinence with the physicians doing the repairs. Surprisingly, the physicians performing the primary repairs have demonstrated a threefold shortcoming on perineal laceration repair. First, many have failed to properly identify what laceration type they encountered in practice. Second, the physicians are unaware of specific anatomy involved⁷ when repairing a perineal laceration. Finally, many physicians demonstrate weak repair technique.

As stated above there is a variety of classification systems at present which may provide confusion and improper primary repair of a patient. In another paper by A. Sultan, he reviews and dissects all of the pertinent textbooks and resources and states the following regarding the classifications:

*“...it is clear that there is a lack of consistency in the classification of third- and fourth-degree tears. Furthermore, previous classifications are incomplete because they do not incorporate depth of external sphincter rupture or involvement of the internal sphincter....if a third-degree tear is incorrectly classified as a second degree, then inappropriate repair could result in sub-optimal outcome.”*⁸ Sultan then reiterates the classification system he had

previously developed to be used universally to prevent misdiagnosis. The system

⁷ Sultan, A.H., Kamm, M.A., (1995) Obstetric Perineal Trauma: an Audit of Training. *J Obstet Gynaecol*, 15, 19-24

⁸ Sultan, A.H., Thaker, R., (2002) Lower Genital Tract and Anal Sphincter Trauma. *Best Practice & Research Clinical Obstetrics and Gynaecology*, 16, 99-115

of classification taught at The University of Texas Southwestern Medical Center at Dallas, found in Williams' Obstetrics, was used in this thesis.

It has also been demonstrated that physicians show a shortcoming when it comes to understanding female perineal anatomy and repair technique. Two additional papers by Sultan spotlight this problem.

*“Seventy-five doctors...were interviewed and a questionnaire was completed. More than half the doctors...who named the muscles that were usually cut during an uncomplicated episiotomy wrongly named the levator ani. There was considerable variation in the definition of a third degree tear. Less than 20 percent of doctors...considered their training in perineal anatomy, perineal repair and recognition and repair of anal sphincter tears to be of good standard.”*⁹

In a more recent paper by S. Siddighi, there is sufficient revelation of the same. He also points out that sphincter injuries are often identified and repaired by “junior residents” who are unfamiliar with the anatomy.¹⁰ These physicians, both

⁹ Sultan, A.H., Kamm, M.A., (1995) Obstetric Perineal Trauma: an Audit of Training. *J Obstet Gynaecol*, 15, 19-24

¹⁰ Siddighi, S., Kleeman, S.D., Baggish, M.S., Rooney, C.M., (2007) Effects of an Educational Workshop on the Performance of Fourth-Degree Perineal Laceration Repair. *Obstet Gynecol*, 109, 289-294

residents and otherwise, lack a good training resource detailing the anatomy and repair of anal sphincter lacerations.

Similar materials

In the above section, it has been clearly shown that physicians have a problem correctly identifying and repairing anal sphincter tears. This may result in a patient suffering anal or fecal incontinence. While there are virtually no comprehensive materials designed to combat this problem, there do exist a few resources that provide some instructional value. This section will address and critique those resources and provide a background for this thesis's final format.

The first and only resource that effectively covers fourth-degree laceration repair is an online paper by Lawrence Leeman M.D.¹¹ This paper is quite accurate and thorough in its coverage of the topic. First, it reviews the anatomy of the area and the components of the perineal body. The paper continues on to surgical principles and their method of repair. Starting with the second-degree or episiotomy repair the article finishes with an outline for repairing a fourth degree perineal laceration followed by postpartum care and prevention.

There are a few important deficiencies in this resource. A sufficient discussion of any classification system is missing. While second and fourth

¹¹ Leeman, L., Spearman, M., Rogers, R., (2003) Repair of Obstetric Perineal Lacerations. *American Family Physician*, 68, Retrived June, 2007, from <http://www.aafp.org/afp/20031015/1585.html>

degree lacerations mentioned, little is said about first and third degree lacerations. Otherwise the text component of this resource is quite complete. The main deficiency of this resource is a lack of quality illustrations and photographs. The first illustration is encountered in figure one (*figure 2-1*) of the article. This illustration has a few faults. First, it is too tightly focused on the perineal body area. While other structures are extraneous it would be helpful to see the rest of the perineum and supporting structures as anatomical landmarks.

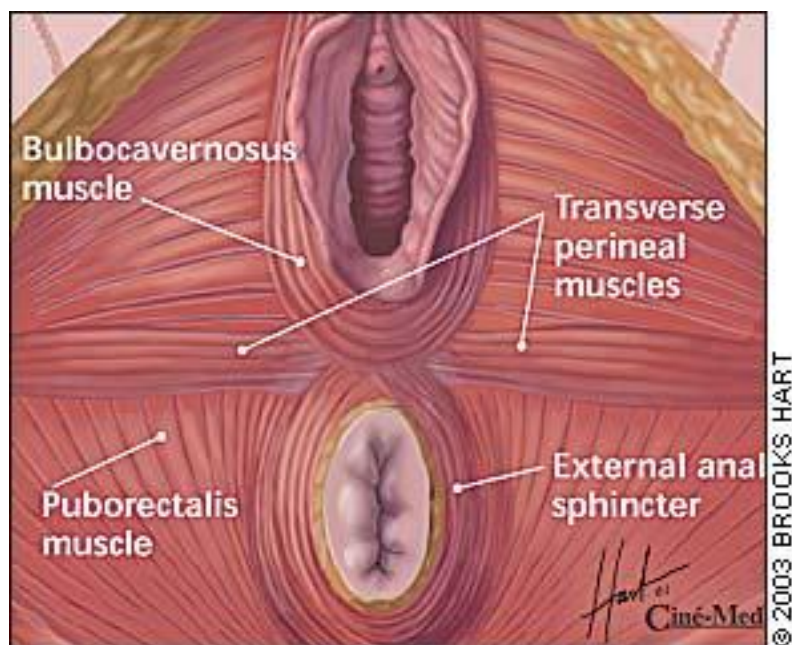


Figure 2-1. Muscles of the perineal body.

Taken from <http://www.aafp.org/afp/20031015/1585.html>

This also includes the attachments for the muscles that make up the perineal body. It would be nice to see these structures because the muscles would be easier to identify in surgery with such landmarks. The artist struggles to establish planes of depth in this illustration. Failure to provide depth makes distinguishing between the levator ani muscles and the superficial muscles that comprise the perineal body very difficult. In particular it is hard to distinguish where the transverse perineal muscle begins and where, what is presumably, the perineal membrane begins. Other illustrations suffer from additional problems. In *figure 2-2* the artist has decided to utilize a very schematic style.



Figure 2-2. Repair of the bulbocavernosus muscle with a single interrupted suture.

Taken from <http://www.aafp.org/afp/20031015/1585.html>

This style is inappropriate for illustrating surgical steps. Again, there is a lack of depth in this illustration. Everything seems to be on a flat plane even the vaginal mucosa, which has been shaded to try to push it back. The muscles that comprise the perineal body are only identifiable as muscles if one already knows the anatomy. Every tissue has a similar color scheme and the “hatching” lines confuse the composition. What the green and yellow tissues are supposed represent is unclear without the provision of labels.

The photographs provided only fare slightly better under critique.

In *figure 2-3* one can see a typical photograph from this paper. Poor resolution

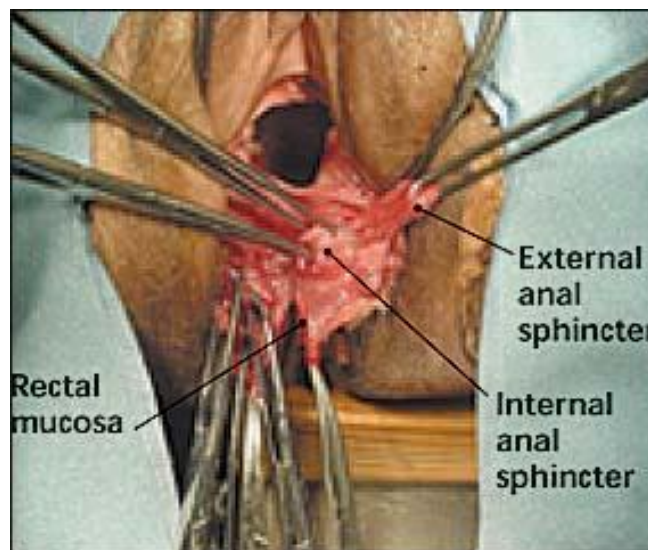


Figure 2-3. A cadaver dissection of the anal sphincter complex.

Taken from <http://www.aafp.org/afp/20031015/1585.html>

hinders this photograph from being a useful instructional piece. When tears of this nature are encountered in practice, they are messy and the tissues are difficult to

distinguish. Poor resolution photographs cheat the viewer out of finding a way to distinguish the structures using textures or variations in color. The viewer ultimately has to rely on trusting in the labels the author has provided, but this will be of little practical use.

As demonstrated, the visual media from this otherwise useful article prevents it from being a single source when a resident or other physician is looking for a material to help them review the procedure. It should be reiterated that at this time this is the only instructional material addressing repair of fourth degree lacerations, outside of an obstetric textbook aimed at OB/GYN residents.

There are other ways in which the procedure is taught besides instructional texts like the one above. Professionally made models have been utilized by some schools to assist in the instruction of repair technique. These models are useful in the right setting but are usually very expensive. They may not have the internal anal sphincter and anal mucosa represented as individual layers. Such practice models, like cadavers and real patients, require an instructor or instructional media to direct the correct repair technique.

As an alternative to these expensive models, the “Sponge Perineum” was developed and presented in a paper by Rhonda Sparks M.D.¹² In addition to the model she developed, the *Family Medicine Digital Resources Library* (FMDRL)

¹² Sparks, R.A., Beesley, A.D., Jones, A.D., (2006) The “Sponge Perineum:” An innovative Method of Teaching Fourth-Degree Obstetric Perineal Laceration Repair to Family Medicine Residents.
Fam Med, 38, 542-544

has posted a series of resources “to aid family medicine faculty in teaching perineal laceration repair, including second, third, and fourth degree lacerations.”¹³ This material is useful to some extent because it instructs you how to make your own cheap sponge model and then provides you with instruction on how to do the repair in a downloadable Microsoft® Power Point® presentation. However, this resource has a few problems as well. The first problem being that the target audience is not OB/GYN residents but family practice residents. This skews the level of detail and surgical principles in a slightly different direction. In *figure 2-4* the limitations of sponge model can be discerned. For example, the model does a good job of representing the external anal sphincter (EAS) and rectal mucosa but completely ignores the internal anal sphincter (IAS) and contributing muscles of the perineal body. It is also not necessarily representative of what a resident may encounter in practice with regards to feel, especially without an anal lumen. Without an IAS or distinct perineal body muscles, this resource cannot be recommended as stand-alone for OB/GYN residents learning a layered approach to a fourth-degree perineal laceration repair.

¹³ Sparks, R.A., Beesley, A.D., Jones, A.D.,(2005) The Sponge Perineum: A Model to Teach Perineal Laceration Repair. Retrieved Novemer, 2007, from <http://www.fmdrl.org/656>

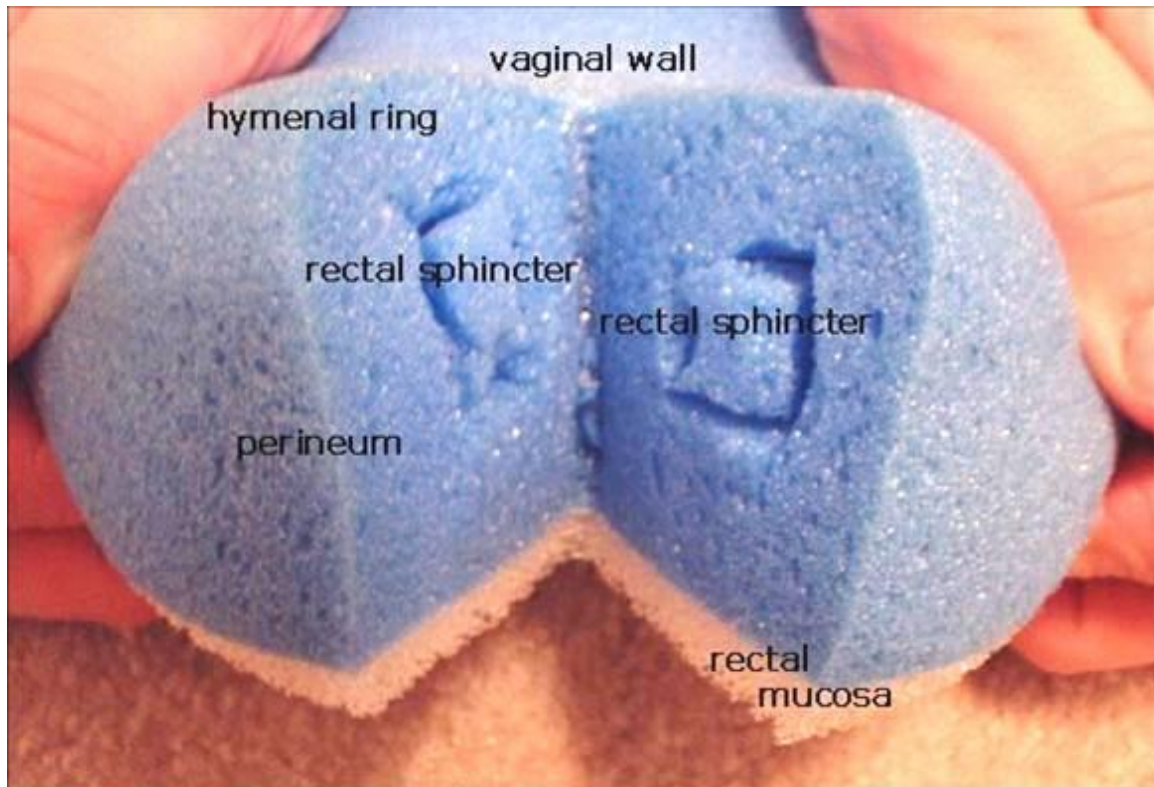


Figure 2-4. The “sponge perineum”

Taken from <http://www.fmdrl.org/656> (“Laceration repar.ppt”)

Finally, there are numerous textbooks that provide information and steps to repair fourth-degree lacerations. As stated in the relevant literature section many of these texts disagree on how to classify lacerations. This could be very confusing to physician attempting to consult multiple texts. In addition, many of

the texts, like the “Sponge Perineum”, fail to reiterate the importance of repairing the IAS.¹⁴

Conclusion

In conclusion, it has been demonstrated that anal and fecal incontinence is an important sequelae that results from poorly repaired perineal lacerations. The poor repairs stem largely from ignorance of the local anatomy, improper identification and classification of the laceration, and poor repair technique. Currently there are few resources available to assist in overcoming these problems. The *American Family Physician* paper has a decent step by step text to instruct an OB/GYN resident, but the visual media is very inadequate and ultimately unhelpful. The “Sponge Perineum” is another online resource that offers instruction, but the target audience skews the information into oversimplification for an OB/GYN resident’s needs. These resources, by themselves do not fill the vacuum, for a material that presents a complete and accurate approach to the anatomy, classification, and repair of a fourth-degree laceration.

¹⁴ Delancey, J.O., Toggia, M.R., Perucchini, D., (1997) Internal and External Anal Sphincter Anatomy as it Relates to Midline Obstetric Lacerations. *Obstet Gynecol*, 90, 924-927

CHAPTER THREE

Methodology

Concept development

The goal of this thesis project was to create a video that would educate first year OB/GYN residents on the subtleties of female perineal anatomy, a basic system for classifying perineal lacerations, and finally a step-by-step walkthrough of the layered approach to repair. This goal was achieved by meeting specific objectives. These objectives helped shape the process which produced the final version of the DVD product. After collecting and sifting through the existing media, it became clear what would have to be developed for our video. The new media, once completed, was then editing together and exported as an *AVI* file that was burned onto a DVD disk. These disks were shown to OB/GYN residents who evaluated the material.

Target Audience

The target audience chosen for this project was first year OB/GYN residents who are either learning the procedure or intending to review the material. All of the visual, audio, and textual elements were designed to address their needs.

Pre-Project Planning

In initial meetings with Dr. Corton and Dr. Roshanravan, many decisions were made about the content and presentation elements of the video that would be needed to ensure that a first year OB/GYN resident would have enough information to learn the procedure. Emphasis was placed on the steps for repairing the IAS. Most of the other resources ignore this important structure when providing information for repairing a fourth-degree laceration. Also included was a series of illustrations and animation depicting the classification of tears.

Production responsibilities were divided among three individuals. Dr. Corton provided content expertise and additional assistance with the video production. Dr. Roshanravan provided additional content expertise as well as a script and voice talent. I provided most of the art direction and produced all illustrations and animations.

A list of all of the illustrations and animations needed was created first so that production could begin on them immediately since they would take the longest to create. Regular meetings were held with the content experts to determine the style, important anatomical structures, and key features of each step of the repair being depicted in an illustration or animation. Additional meetings

and a mailing system were set up so that corrections could be given in an orderly and timely fashion since most illustrations were interconnected.

The script written by Dr. Roshanravan at approximately the same time the list of visual media was being created. This script had to be synchronized with the list of illustrations so that there would always be something on the screen while the narrator was speaking. This was particularly true concerning the anatomy and surgical repair sections. As pencil roughs for the illustrations were created, they were taped in a visual timeline on a wall. This timeline served as a storyboard as the scrip was read allowed ensuring that nothing was missing. Once all the final versions of the illustrations were decided the roughs were brought into Adobe® Premiere®, where the script was crudely recorded to determine timing. As the project drew to a close the final script was approved by Dr. Corton and was recorded by Dr. Roshanravan at the University of Texas Southwestern Medical Center's Medical Television Center.

In addition to the illustrations and narration, surgical video of the repair would be shown after the illustrations to reinforce the steps. This video had to be kept in mind with the development of the script. OB/GYN fellows recorded the OR footage while Dr. Corton edited it together with the narration. Other aspects of the script called for still images. These images were taken by Dr. Roshanravan. I also provided some assistance and art direction as the stills were being staged.

The final media components of the project were the animations. One animation was needed to show the tearing process *in vivo*. Another animation was created to clarify the EAS repair portion of the surgical footage. This video clip would overlay the footage and was roughly timed to match the repair process. These animations were edited in the final timeline as one of the last steps in the production process.

The Illustrations

Anatomical Illustrations

The very first illustrations discussed in the pre-planning meetings were the anatomical illustrations. These illustrations would be shown first with the anatomical review portion of the video so it was important to develop an informative style. After the style was determined the illustrations would be first sketched by hand and taken into the computer where they would be completed. After they were completed the illustrations would be edited together to create a very simple type of animation. This process would also be used later with the surgical illustrations.

In the pre-project planning phase there was a lot of discussion about how best to depict the female pelvic anatomy. Since female pelvic anatomy is some of the most complicated for a med student and even a resident to comprehend

completely, a fresh approach was needed. Since the pelvis has many of its components on similar levels of depth, or layers, I decided to approach illustrating the pelvis as a “layered cake”. Each of the layers would be placed on a literal layer in Adobe® Photoshop® that could be turned off to reveal underlying layers.

Determining the illustrative style was also important. Since I was going to approach this series of illustrations with the “layer cake” concept in mind, a mostly realistic style would be necessary. A complete amount of tone with full color would bring the illustrations closer in feel to the still photos and surgical video. I also placed the pelvis at a slight angle to maximize the effect of the layers and depth perception. The result was an idealized and clean representation of female pelvic anatomy.

I used several resources as reference materials to assist with the creation of the illustrative style. To establish the visual look I improved upon the layout of the Brooks Heart illustrations depicting the laceration (figures 3 and 9); found in the *Repair of Obstetric Perineal Lacerations* article by Leeman, et al. I also utilized illustrations done by Leanne Kruger that depicted the female pelvis and levator ani, as well as a three step series showing a fourth degree repair. These illustrations by Leanne were created for one of Dr. Corton’s earlier projects. Atlases, such as *Grants Atlas of Anatomy* and Frank Netter’s Atlas were also consulted for style and content. Dr. Corton also provided numerous cadaver stills and surgical video as reference material.

Seven initial pencil illustrations were sketched by hand and then taken into Adobe® Photoshop®. The first and key illustration that I drew was the bony pelvis. This illustration would serve as the “backbone” of all the others in this series. All of the muscles and their attachments ultimately connect back to the pelvis so drawing the pelvis first determined the shape and placement of all the other tissues. I rendered the pelvis from a plastic model provided by Dr. Corton, with a few corrections since the model was slightly crooked. After I drew the pelvis in the center of white layout bond, I added three tick marks asymmetrically around the illustration. These tick marks (*figure 3-1*) would serve as an alignment reference once I brought the illustrations into the computer. To create the

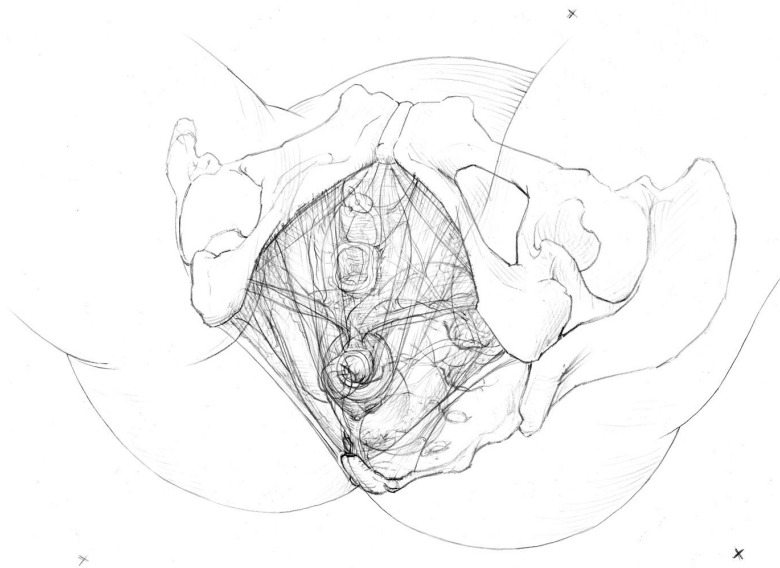


Figure 3-1. The “tick” marks were created to help align the all of the initial sketches as shown here.

subsequent illustrations I traced a simple outline of the original pelvis and tick marks. Then I rendered the tissues of that layer on the same paper. Here is a list of the base sketches that I rendered by hand starting from the pelvis: pelvis, pubococcygeous with colon, levator ani muscles, perineal membrane, superficial perineal muscles, and the skin and outer anatomy (*figure 3-1*).

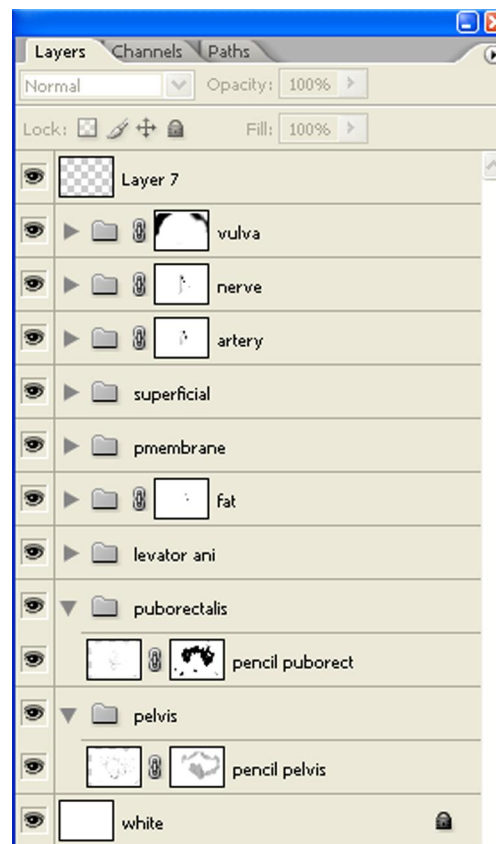


Figure 3-2. Folders with embedded pencil layers.

Once these sketches were completed I scanned them into the computer using the import feature in Adobe® Photoshop®. I then copied and pasted them

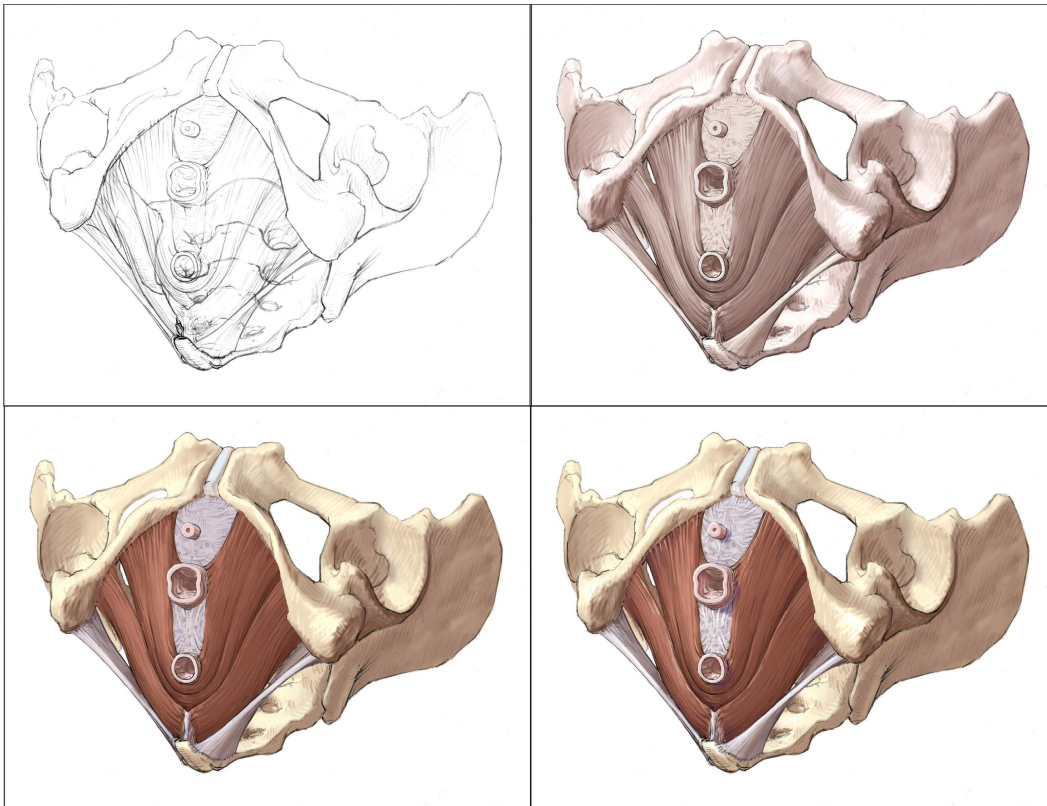


Figure 3-3. The pelvis and the levator ani. This series is a progression from sketch to tone and color through the final details.

into separate layers in a single .TIFF file. The .TIFF file had a resolution of 300 dpi with a canvas size of 5 inches (width) by 3.634 (height) inches. Since all of the pencil layers were opaque at that point I changed their layer blending properties to “multiply” so that each of the pencil lines would show through when I applied paint to an underlying tonal layer. This also allowed me to line up all of the three ticks on each of the drawings. I started to make selections after dropping each of the pencil layers into their own appropriately named folder (*figure 3-2*). Using the mask tool, I painted masks for each of the layers and then saved them.

One by one, I turned the selections “on” and painted a grayscale tone layer in each of the respective folders. I then went into the color balance dialogue and adjusted each tone layer into a sepia based color.

Color was an important facet of the illustrations (*figure 3-3*). To make sure the anatomy section matched the other illustrations I had to choose similar if not exact color schemes for each of the tissues. This gave a cohesive quality to all of the illustrations in this project.

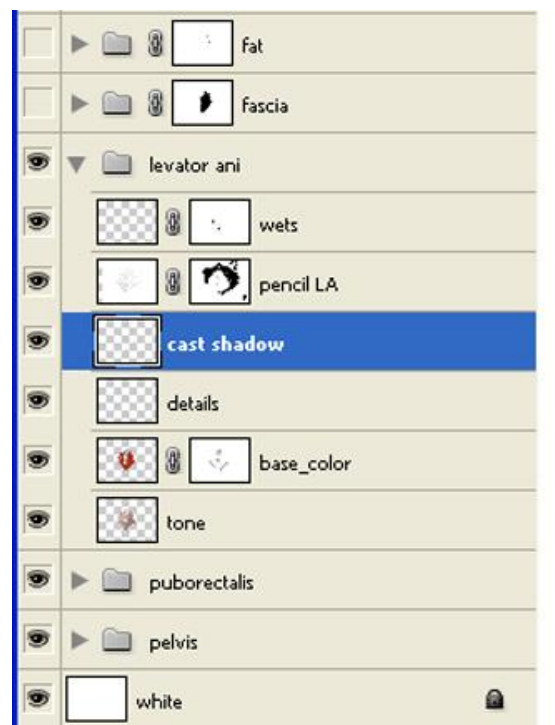


Figure 3-4. An example of the layers within the levator ani folder

To ensure that the individual color layers did not multiply into the contents of other folders I placed the tone layer at the bottom with the blending property

left at “normal” this would ensure that the particular folder and anatomic layer were left opaque to the other layers. On top of the tone layer I then created the necessary color layers and set their blending properties to “multiply” so that the tone would show through with the desired color on top. The final layer found on the top of folder was of course the original pencil layer only superseded by a highlights layer (*figure 3-4*). The painting part of the process was complete.

I now had to touch up the organization and clean up each of the layers for the final export of each image. Each of the folders was collapsed so I was only dealing with the folders and not the individual layers. I added a “layer mask” to each of the layers so that I could clean up any edges of each anatomical layer. The “layer mask” (*figure 3-4*) was also important for the vulva/skin layer since most of the external genitalia and skin would need to be invisible in order to see the underlying structures. It was also at this point I added some of the other structures that did not need an initial sketch, such as certain fascial layers or the diamond overlay.

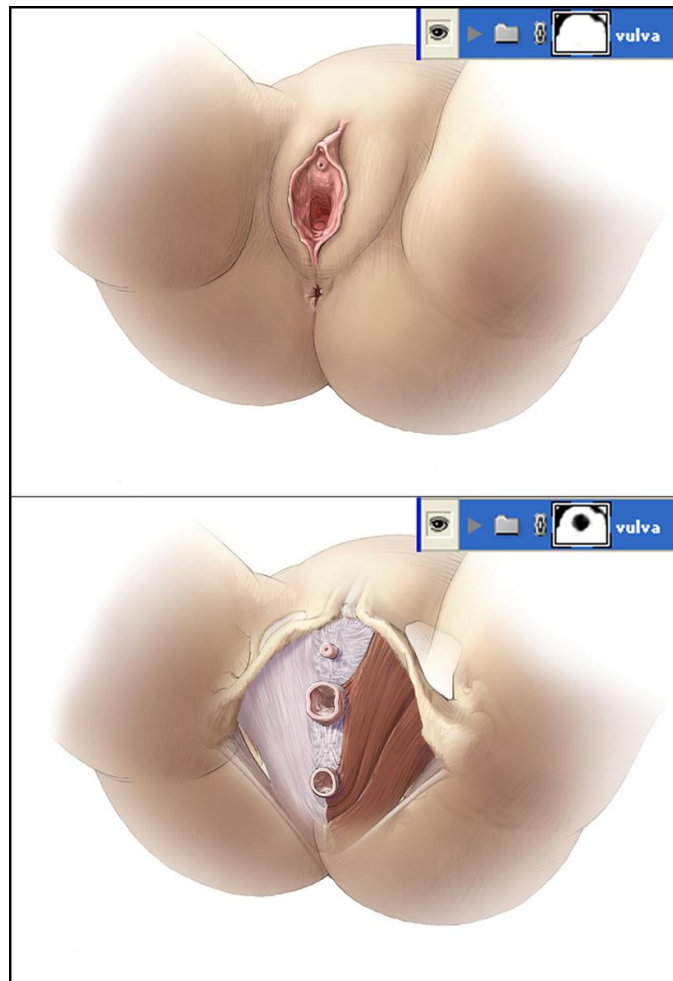


Figure 3-5. I create a “hole” in the vulva folder using the layer mask.

The last step in creating the anatomy series was to export all of the required images. To do this I started with all of the folders turned on and saved a .JPEG copy. Then one by one I turned a layer off and saved a .JPEG copy. The result was a series of .JPEG keyframes that would be edited in Adobe® Premiere® to create a simple animation where each of the layers of anatomy could be peeled back revealing the underlying compartments.

Surgical Illustrations

To meet the other two objectives of this thesis project, an additional two series of illustrations would have to be created. The first series of six illustrations was intended to supplement the classification animation section of the video. The other series would be the largest with over twenty-four illustrations depicting a step by step overview of the repair. These surgical illustrations provided a slightly different set of challenges than the anatomical illustrations.

The style of these illustrations was decided to be very similar to that of the anatomical illustrations. Since the repair happens in a very small area, the viewer would have to be taken very close to the perineum and anal region. I also decided to slightly exaggerate some of the anatomy, particularly the external anal sphincter (EAS). The EAS would be relatively smaller in an actual repair but, it would be more difficult for the viewer to see some of the details of technique in the illustration. The suture placement in the “clockface” positioning system was especially difficult to understand with a small EAS. Two other muscles were given more attention and clarity than would otherwise be encountered in practice. The *bulbocavernosus* and *superficial transverse perineal* muscles were given a distinct muscular color that would not be encountered in practice. I made this design choice to help clarify the steps when those muscles would be repaired.

Like the anatomical section, I employed a simplified animation style when the final illustrations were brought into the editing software.

These illustrations were created using a similar process than the one used in the anatomical series. Since the illustrations were more intricate and complex in their number of layers I had to save each of the illustrations as individual TIFF files. To ensure that each illustration melded seamlessly into the next one in the final timeline, a master background illustration was needed. Since the first illustration in the series was a depiction of the fourth degree tear itself I felt that it had all of the components that would provide the background for the rest of the repairs. This first illustration was the only illustration that had its own complete sketch (*figure 3-6*). I sketched the illustration on white layout bond. Since the vagina and labia changed little from illustration to illustration they served as the anchor for each piece. All subsequent steps were sketched, but only the laceration and anal skin changed so I ignored the vulva.

Once I had completed all of the sketches, I scanned them into the computer using the import function in Adobe® Photoshop®. I saved each sketch in its own file with a numerical extension correlating to step in the repair. This made it easier to find if the illustration had to be edited. This fourth degree perineal laceration drawing was the first to be colored and toned. I used the same process that I used with the anatomical series. First, I created a white background layer. Then I created selections for each of the anatomic structures and painted in

the tonal scheme of the piece. I adjusted the grayscale tone layer into a sepia tone using the color balance dialogue box. On top of the tone layer I created color layers that were multiplied onto the tone layer. The pencil layer was multiplied on top of everything else but beneath the highlights layer. This was the final layering order of the master illustration for the surgical series.

I saved the illustration and collapsed it into a single folder. This folder would serve as the background for the next illustration. I brought the folder into the 'subsequent step' file and placed it beneath the new pencil sketch layer (*figure 3-7*). All toning and coloring was done on top of this folder so that only the central action being performed would change and not the background, from piece to piece. I carried this process from illustration to subsequent illustration. The previous illustration was collapsed or flattened and placed as the background for the next illustration. The final result is a seamless stream of action steps from the repair.

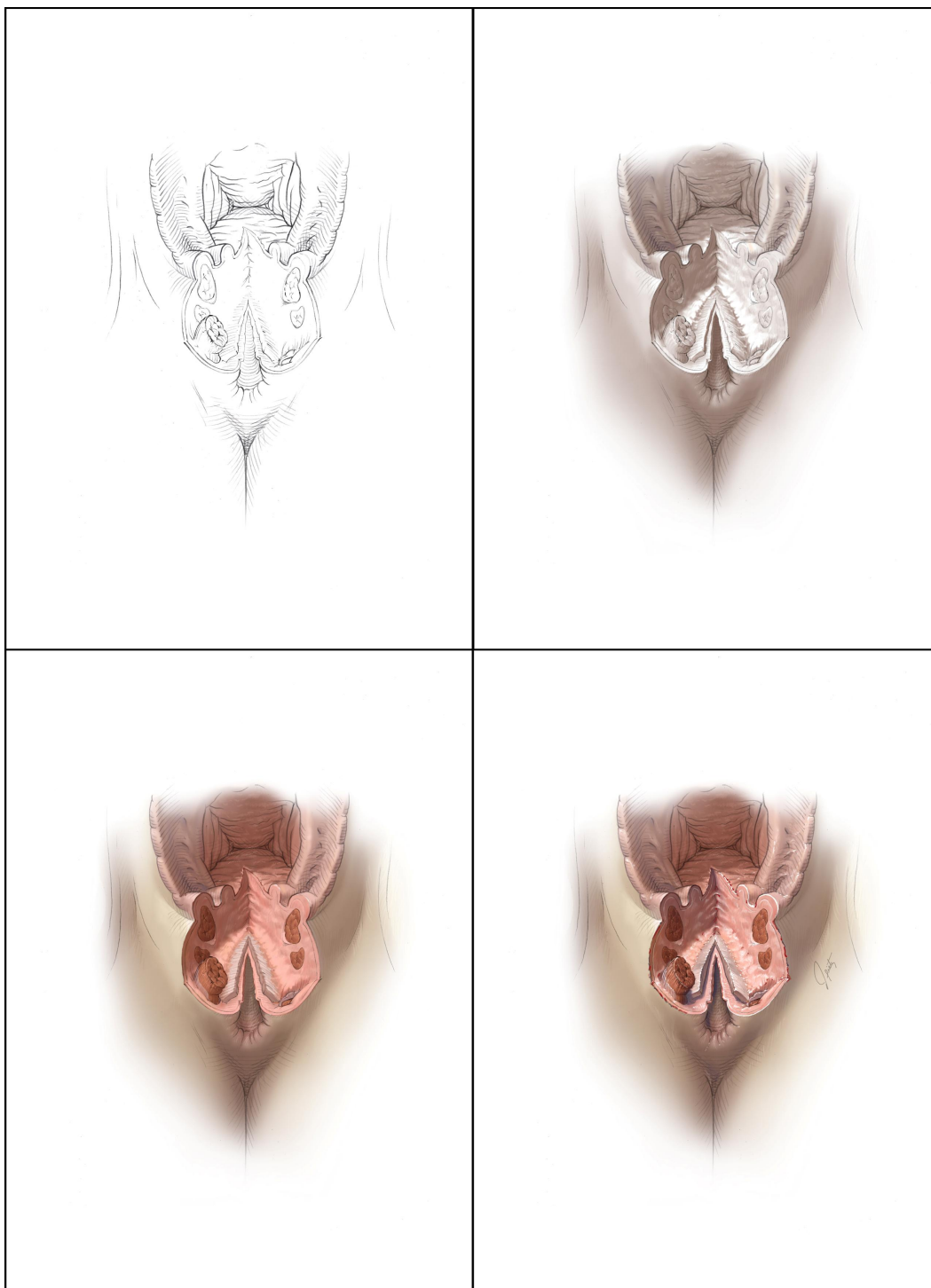


Figure 3-6. Fourth-degree laceration. This series shows the illustration process: sketch, tone, color, and details.

One illustration in this series posed a particular challenge. The “clockface” sequence was more complicated than the other illustrations in this series. I painted and organized the basic illustration in the same manner as all of the other illustrations. On top of all of the other layers I created a white mask and painted in two symmetrical grey clocks as backgrounds. I made another layer with the clock numbers on top of the previous layer. To make the individual numbers glow when the corresponding suture glowed, I painted a layer mask over the numbers that were not supposed to glow (*figure 3-8*). This strategy was also applied to a layer with the sutures in it. Each suture had to be painted in with the layer mask and could be easily edited if a mistake was made. I exported each one of the number/suture illustrations like the rest to create a slightly more complex animation depicting one of the most difficult concepts of the repair.

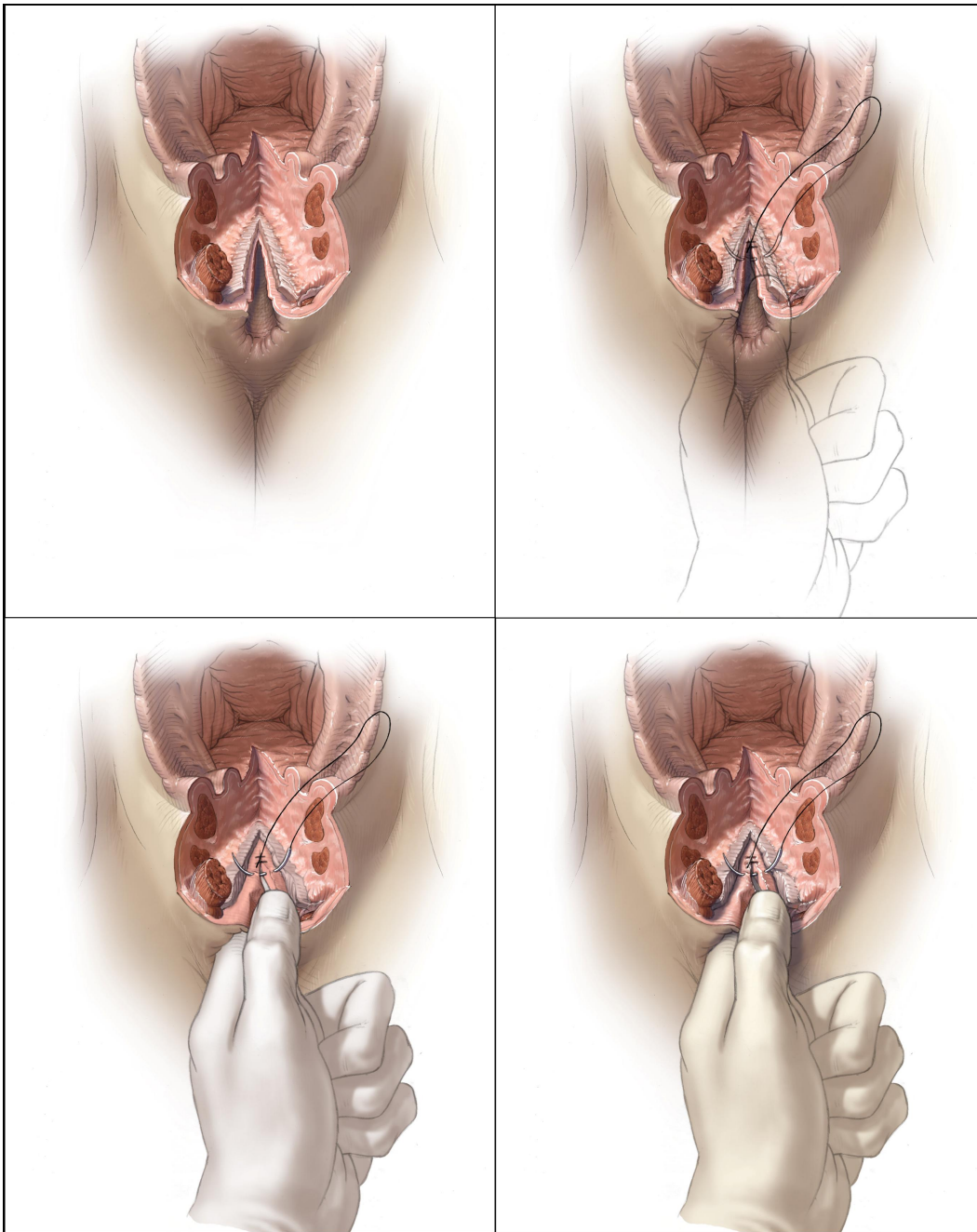


Figure 3-7. The figure in the upper left shows the flattened version of the fourth-degree laceration illustration. This illustration was saved in a folder (named “Group 1”) in the file for the next illustration. In the upper right figure, the pencil layer was added above the “Group 1” file. In the next two figures additional tone and color are added. The result is a seamless transition of anatomy from the first illustration to the next.

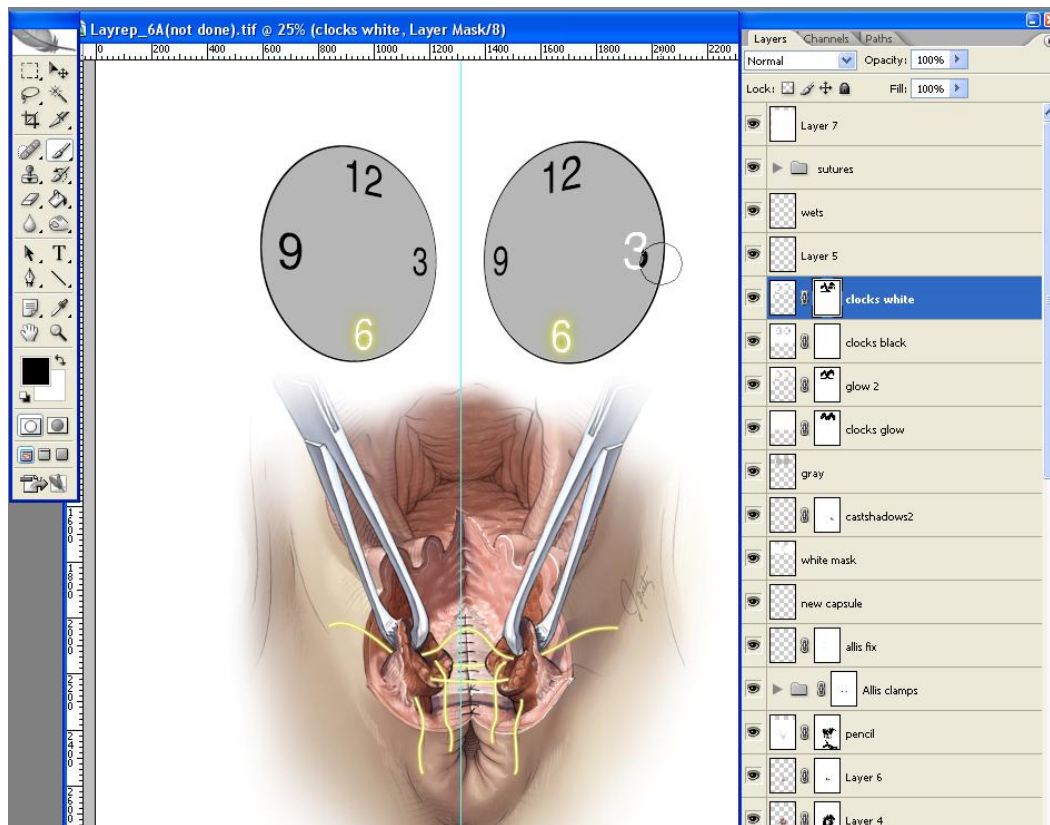


Figure 3-8. A layer mask was used to block out the white of the numbers that were not supposed to glow.

In conclusion of the creation of the illustrations, I drew an initial sketch or sketches by hand and then scanned them into the computer. I then painted a tonal layer and multiplied a series of color layers on top of the tonal layer, all in Adobe® Photoshop®. I exported each image as a 5 inches (width) by 3.634 (height) inches 300 dpi .JPEG and edited them together in Adobe® Premiere® to

make a simple animation. These illustrations would be combined later with other media to fulfill the objectives of this project.

The Animations

Vaginal Birth with Tearing Animation

One of the objectives of this project was to create media that would instruct the OB/GYN residents how to classify the types of lacerations they might encounter in practice. The six illustrations already created effectively depicted the four types of lacerations. To supplement these illustrations, an animation was created showing the “tearing process” since video of a tear occurring would be difficult to acquire. The animation was created using stills drawn by hand and the rest was made in Adobe® Aftereffects®. The result is a seven second multi-layered animation that depicts a baby’s head slowly crowning and the vaginal mucosa finally tearing under the strain.

To ensure this animation would successfully meet its goal; pre-production planning was required. Research had to be done to make sure the birthing part of the animation was correct. Various obstetric textbooks and videos were consulted as reference material. After the research was completed, initial sketches were created to assist with the conceptualization process. Finally, a storyboard

(Appendix A) was created so that the concept could be approved by the content experts before production began. The storyboard provided a timing reference and a guide for the visual elements of the animation.

After pre-production was completed, all still elements and aids could be created. A still element was an illustration component of the animation that did not change. Since the still elements were illustrations the process for creating them was similar to other illustrations for this project. To keep the style of the animation in the same vein as the illustrations I redrew the anatomical series from the front. This made all of the color and design choices less complicated. The technical level of the animation demanded that the detail in the animated elements be diluted relative to the still elements. All still elements apart from the baby's head and the mothers legs, were left under painted to avoid a design conflict. Here is a list of all of the still elements: the baby's head, the legs and part of the perineum, and the pelvis. Each one of those images was saved and imported as a .PSD, .TIFF, or .JPEG file with an alpha channel so they could be overlaid with other still elements and the animated layers.

An aid was a still element that would not actually be in the animation but assisted with the creation of other animated elements. The first aid I created was another version of the baby's head. On this version of the baby's head

I drew five concentric shapes (*figure 3-9*). Each shape corresponded to how much of the baby's head was peaking out of the birth canal. Each shape also represented a key frame for the animation. Once these key frames were

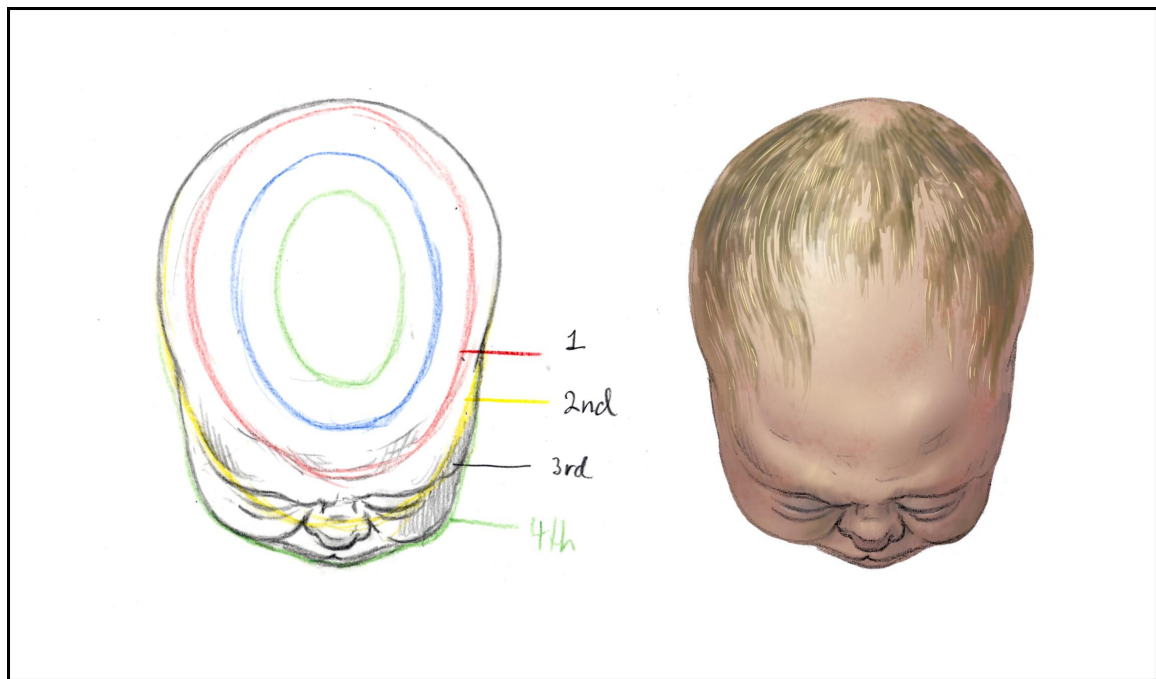


Figure 3-9. The baby's head template with concentric "key frame" shapes.

established it was easier to visualize how the anatomy might be affected by the protrusion of the head. Two additional series of aids were made after the baby's head was completed. The first series was the levator ani muscles. To create these six aids I traced the baby's head onto six different pieces of white layout bond. Then starting with the smallest shape I constructed the levator ani muscles around the head shape and displaced them appropriately. Since the levator ani muscles are not torn in a fourth degree laceration these aids would only represent the

varying levels of displacement (**figure 3-10**). The next series was a little more complex, since the superficial perineal muscles are directly involved in a tear. I followed the same process as the levator ani muscles but I had to discern when the muscles were torn and how they retracted. Once all of the aides were sketched I brought them into the computer with the still elements. I placed each of the aides ten key frames from the previous one and then traced a solid around each of the muscles on their own distinct layer with the change shape toggle turned on. Subsequent details layers were added after the initial animation was finished. All of this was done in a special superficial muscles composition (**figure 3-12**).

The next composition I worked on was the skin and vulva animation. This time I used the baby's head aid directly as a template to determine the displacement of the genitalia. Since the baby's head was only one drawing I adjusted the original solid tracing ten key frames later over the next concentric shape with the shape properties toggle turn on under the layer mask dropdown. This animation was also different since the solid mask was actually inverted and was placed on the mother's legs still element. The result was a dilating 'hole' that revealed the underlying head (**figure 3-11**). I stroked the hole with a dark red color to simulate the mucosa color and highlight the head.

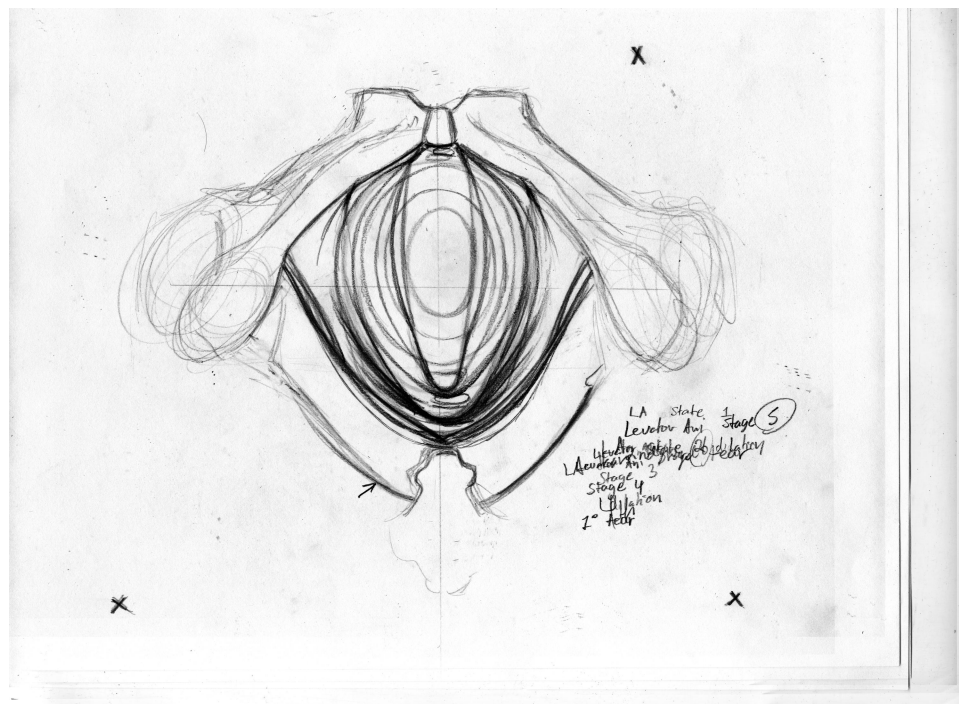


Figure 3-10. The five stages of displacement for the levator ani multiplied on top of each other.

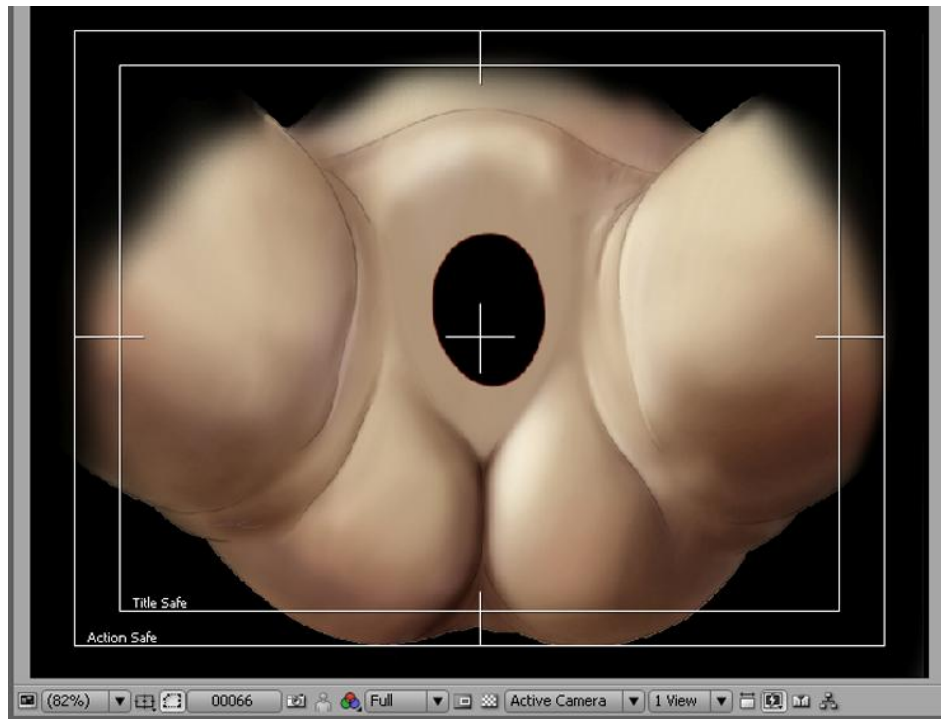


Figure 3-11. The dilation mask.

Additional solid layers were added to simulate the changing terrain of the perineal skin. I also added two small JPEGs layers each representing one of the labia. I rotated each image and slowly adjusted the opacity as the labia were stretched and became indistinguishable from the rest of the skin. All of the elements were now ready to be placed in the final composition. Each of the three previous compositions were dropped into the new composition as single layers. Further editing could be done to the original composition which would then be updated in the final composition. I created a white background solid and placed the pelvis on top as the secondary background layer.

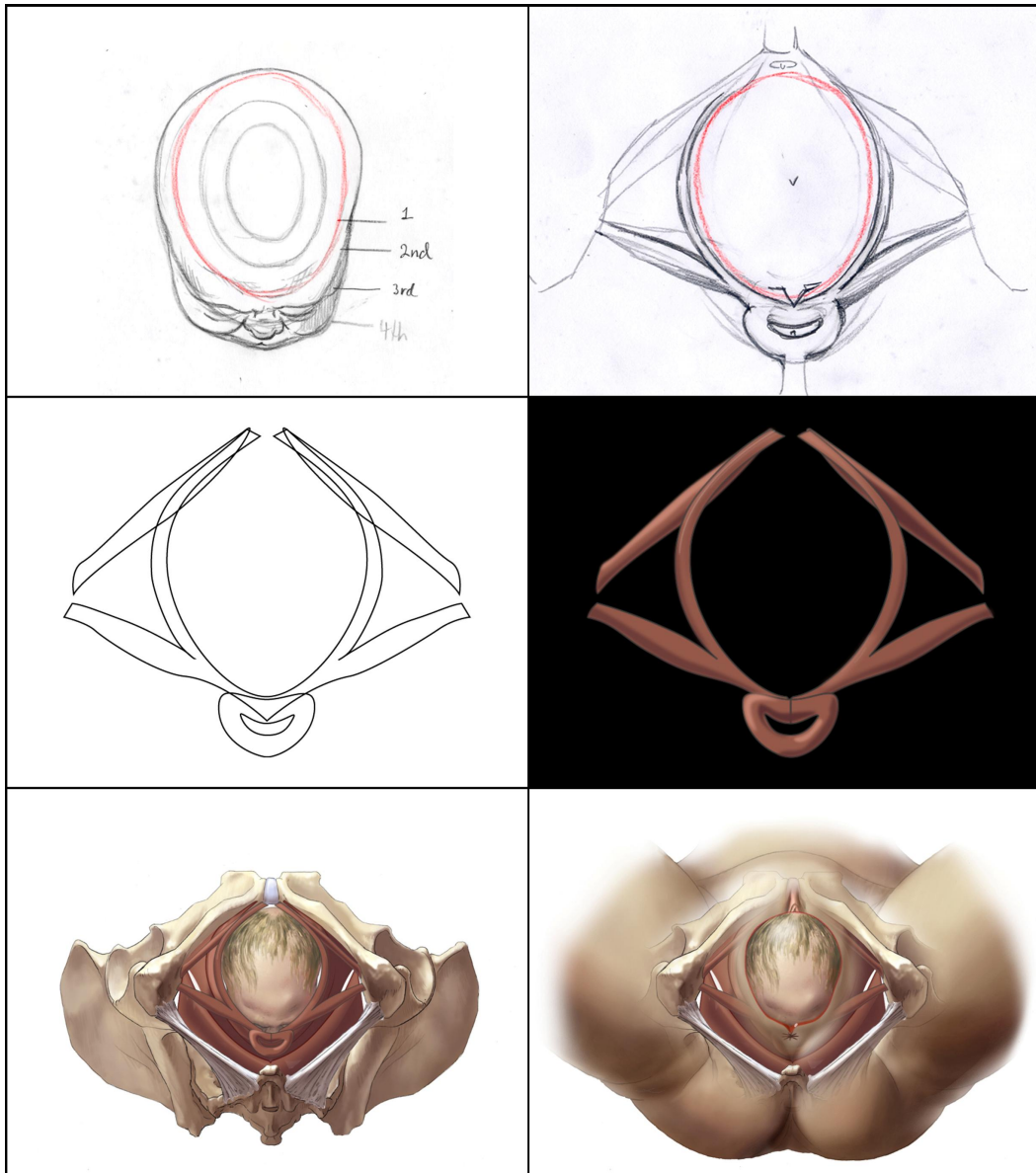


Figure 3-12. This figure shows the steps in the creation of the superficial muscle component of the animation. 1) The upper left panel shows the baby's head with the dilation at a first degree tear 2) the upper right panel is the sketch depicting the displacement of the muscles around the head 3) middle left panel shows the vector trace of the pervious sketch. 4) this panel shows the fully animated composition created in Adobe® Premiere® 5) this panel shows the muscle composition edited in with the still elements. 6) the lower right panel shows the muscle composition as it appears in the final composition.

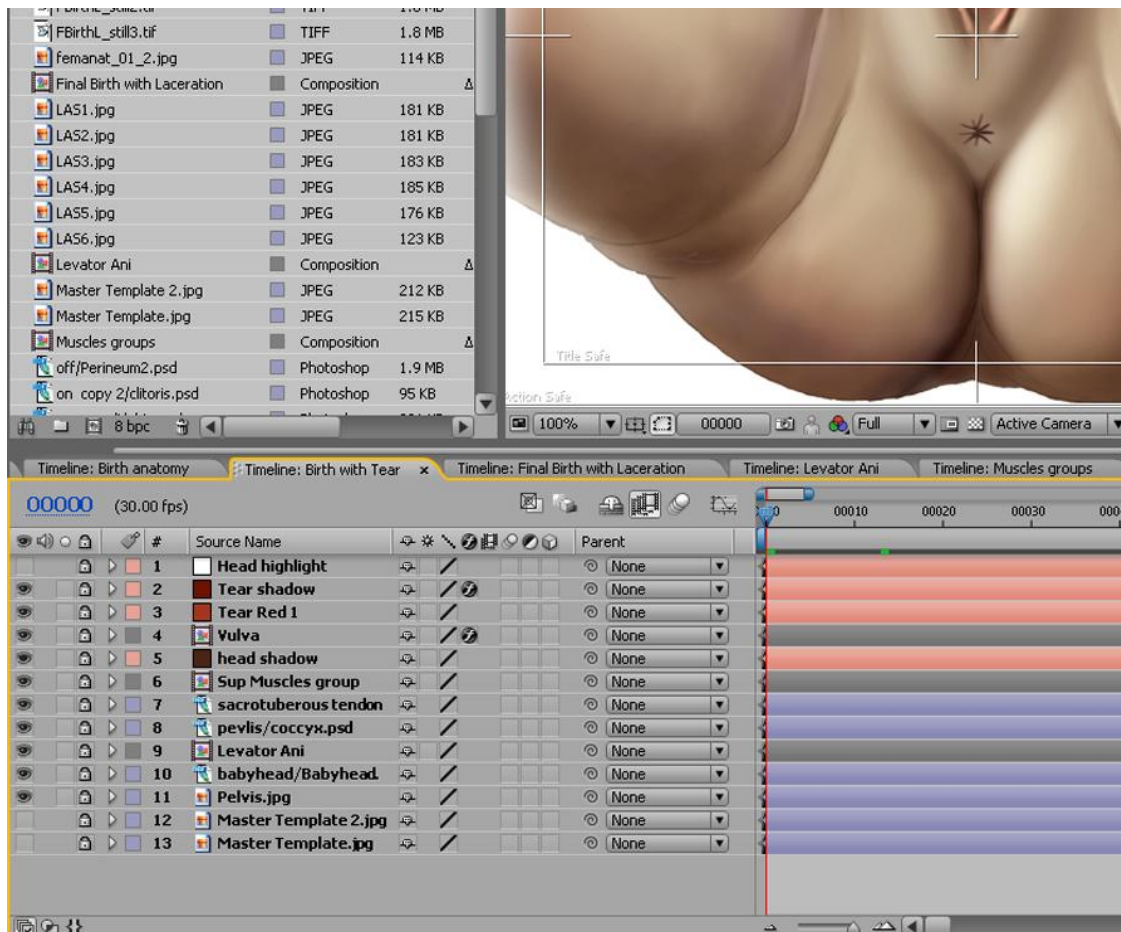


Figure 3-13. The layer order for one version of the animation.

The baby's head and the skin composition would take the next layers. The next layer was the levator ani composition followed by the superficial complex composition. On the very top I created an additional couple of solid shapes to simulate the growing tear. This layer order (*figure 3-13*) would allow this animation to be rendered multiple ways. The two ways that ended up in the final video were a semi-ghosted skin animation where the muscles were visible and a

render with just the perineal skin visible. I exported these two animations from Adobe® Aftereffects® with a resolution of 800x600 at 30 frames per second. The file type was a Quicktime® .MOV file that was uncompressed to maximize the quality for the final video.

EAS Repair

The EAS repair animation was created to help clarify part of the surgical video. This animation was just a more complex variant of the original clockface series. I created this animation in the same manner as the *Vaginal Birth with Tearing Animation* in Adobe® Aftereffects®.

Pre-production planning for this animation was easy since I already had the illustrations depicting that part of the repair. That illustration contained extraneous information, so a new still element depicting just the EAS was created for the new animation. I drew two new sketches of the top third of the EAS. One of these depicted the ends of the muscle unattached while the other illustration showed the ends sown together. As a separate sketch I also lightly traced the muscles and placed the sutures. This drawing would be the only still element to be animated.

I imported the sketches into the computer and started to animate them. Then I painted the muscles using a simpler yet similar style as the original illustrations. I exported the drawings as JPEGs into Adobe® Aftereffects®. This

animation required only one composition due to its simplicity. The two still elements remained on the bottom layer while I set the blending mode of the suture image to “multiply” this made it seem like the sutures were part of the torn EAS image. I then traced a generic mask around all of the sutures, but inverted the mask so that the sutures were hidden. Then one at a time I changed the shape of the mask to slowly reveal (*figure 3-14*) the sutures. This gave the appearance that each suture was threading its way through the muscle. The protocol for suture placement was six o’clock from right to left, followed by three/nine and then the twelve o’clock positions. I then faded out these two top layers to reveal the repaired EAS.

This animation would be edited into the final video later on in Adobe® Premiere®. I exported it from Adobe® Aftereffects® as an 800x600 Quicktime .MOV at 30 fps. The .MOV file was uncompressed to allow for a higher quality when the final product was exported to DVD.

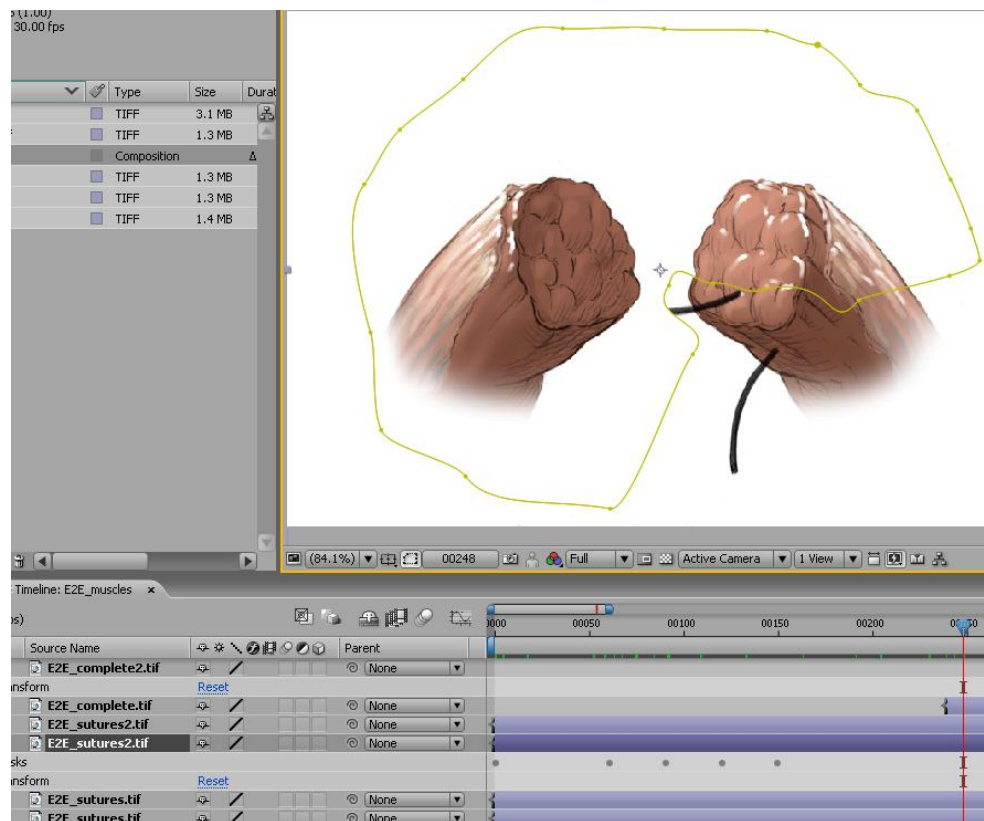


Figure 3-14. The suture mask was slowly manipulated to reveal the weaving suture.

Final Product

Once all of the media elements were completed the final product could be edited together. Dr. Corton provided much of her time to edit together the surgical video clips and audio components since she was familiar with the surgical video and the script as well as Adobe® Premiere®. I provided the final editing of my illustrations and animations as well as the surgical principles section of the video.

I also did a majority of the titling and labels using the Adobe® Premiere® titling feature.

The last aspect to be edited in was the EAS repair animation. Since the animation would overlay some of the surgical video with a diffuse background, an effect like that could not be done in Adobe® Premiere®. I exported the surgery clip from Adobe® Premiere® as an uncompressed .MOV at 720x480. Once I was in Adobe® Aftereffects® I placed the animation .MOV on a layer above the surgery .MOV. I scaled the animation and multiplied it so that it would overlay the footage. Then I created a small solid and gave it a large feather property. I then exported the whole thing out again uncompressed as a .MOV at 720x480. Back in Adobe® Premiere® I imported the .MOV and dropped it in to replace the old file. The result is a seamless overlay. The final export (*figure 3-15*) was a compressed .AVI file using the DV(NTSC) compressor at 720x480. The frame rate was 29.97 fps with a pixel aspect ratio of 01/DV NTSC (0.9). The .AVI file was taken to a DVD making software and exported onto a DVD.

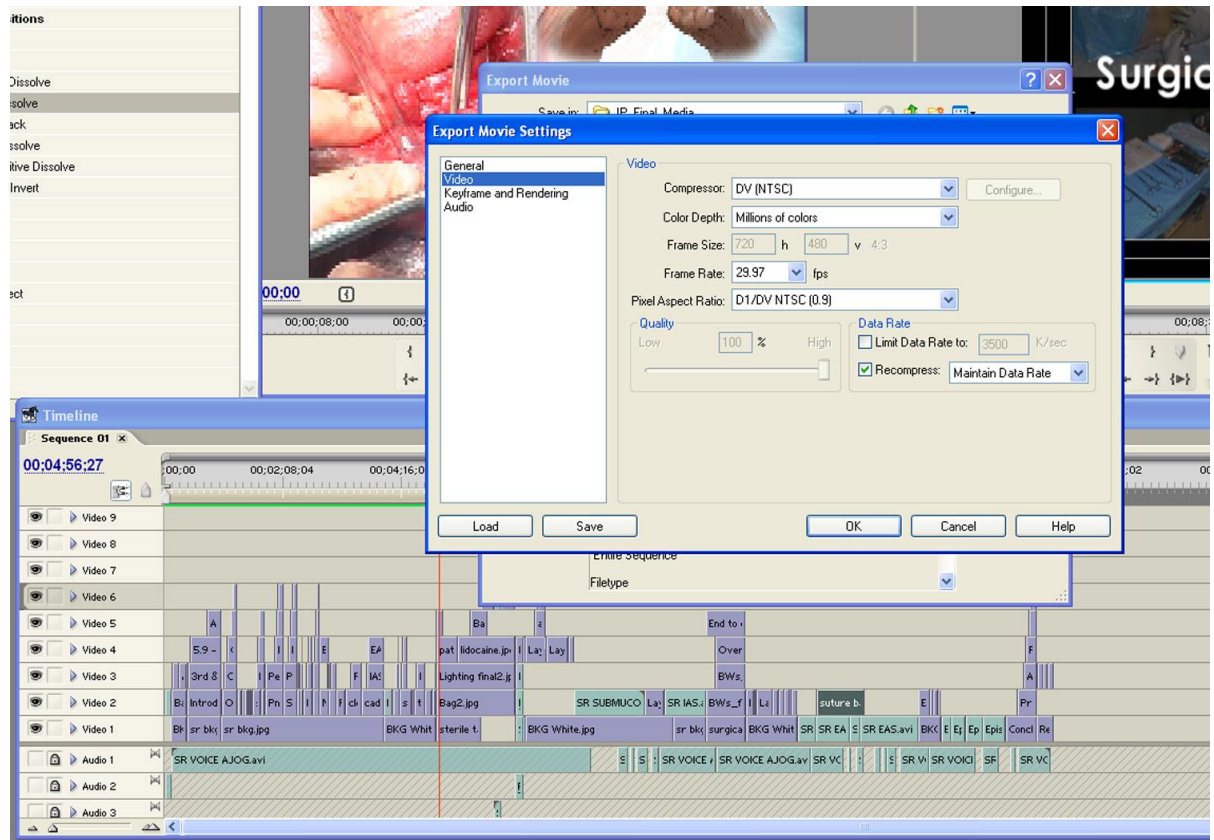


Figure 3-15. The final output settings for the DVD.

Conclusion

In conclusion, this project had three objectives, the last of which was to create all of the necessary media that would be clear and instructional. To create this media a habit of regular meetings with the content advisors was necessary to maintain a standard quality and relevant information in the final product. The result is a series of over thirty illustrations and two animations. This media was imported into Adobe® Premiere® and edited together to create the final product complete with narration and a running time of sixteen minutes flat. The DVD was now ready to be taken to the target audience for evaluation.

CHAPTER FOUR

Evaluations

Survey Development

A completed DVD version of the video was shown for review to current OBGYN residents and fourth year medical students doing OBGYN rounds at Parkland Memorial Hospital. A survey was created and given to the viewers to be filled out before and after watching the video. The survey had a total of twelve questions with five pre-viewing questions and seven post-viewing questions. Each of the questions utilized a five point Likert scale with “1” being “Strongly Disagree” and “5” valued at “Strongly Agree”. The residents and medical students were asked to circle the number that corresponded best to their level of agreement with each statement. The first five questions, to be answered before watching the DVD, were designed to test the viewers’ knowledge on the subject and discern their pre-conceptions about the format of the information. The last seven questions, to be answered after watching the DVD, were designed to evaluate the effectiveness of the information, use of multi-media, and the format. After each statement was additional room for comments if the viewer had a specific statement. The final survey was created in Adobe® InDesign® and printed out for final use.

Survey Distribution

The DVD was shown to two groups. The first group consisted of seven OB/GYN residents and the second group was comprised of four fourth year medical students participating in an elective round. Inclusion of this group was allowed because they have a very similar experience and knowledge base to first year OB/GYN residents, most of whom have not even performed this surgery. Before watching the video each group was asked to fill out the front of the survey. After watching the video each group could fill out the back with the other seven questions. All eleven individuals completed the survey.

Survey Results

The surveys were collected and evaluated. A graph was constructed to organize the data (*figure 4-1*). SA means Strongly Agree, A means Agree, N means neutral, D means Disagree, SD means Strongly Disagree. Space was provided for additional comments.

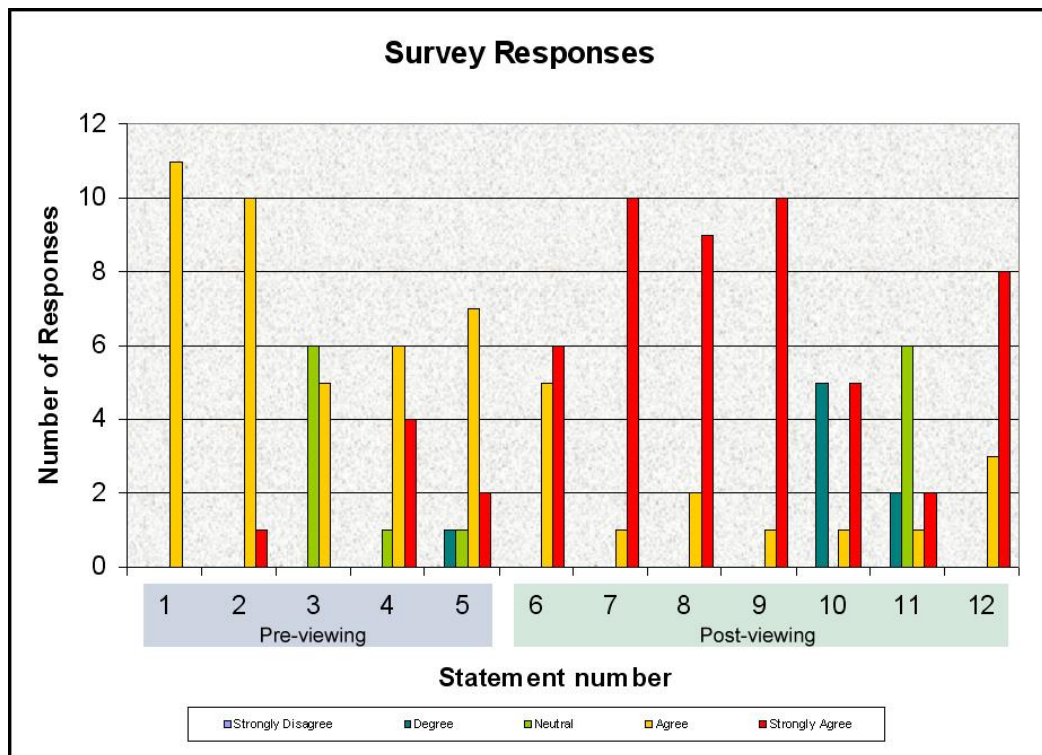


Figure 4-1. A summary of the survey responses.

List of Statements:

Statements asked before viewing the video

1. *I have a thorough understanding of female pelvic anatomy*
2. *I have a thorough understanding of the classifications of perineal lacerations*
3. *I have a thorough understanding of the surgical principles and repair process of a fourth degree laceration*
4. *I think that a mediated instructional material would help me or someone else improve their comprehension of this topic outside of experience and a normal text on the subject*
5. *I think that a video format is a good way to receive this information*

Statements asked after viewing the video

6. *After watching this video I have a thorough understanding of female pelvic anatomy*
7. *After watching this video I have a thorough understanding of the classifications of perineal lacerations*
8. *After watching this video I have a thorough understanding of the surgical principles and repair process of a fourth degree laceration*
9. *I think that the illustrations and animations were clear and helpful*
10. *I think that the OR video and stills were understandable without the interpretation of an illustration*
11. *I think that a different format (such as an interactive program), where the content is broken down into separate modules, would provide easier access to the more practical content of this video*
12. *I would view this again to help review the information or prepare for surgery*

Evaluation of Responses

Statement 1: I have a thorough understanding of female pelvic anatomy.

11 Agreed

This, and the subsequent two statements, were asked to evaluate the relative knowledge of the individual before s/he viewed the DVD. The response was an overwhelming “Agree”. Since this survey was shown to two groups of varying levels of education, it is noteworthy that the medical students rated themselves as high as they did.

Statement 2: I have a thorough understanding the classifications of perineal lacerations.

10 Agreed, 1 Strongly Agreed

The responses for this statement were similar to the first statement, with one person confident in their knowledge of the classification systems. This is also surprising considering the two pools. As expected the individual who “Strongly Agreed” was a resident

Statement 3: I have a thorough understanding of the surgical principles and repair process of a fourth degree laceration.

6 Neutral, 5 Agreed

The responses for this statement were expected to be the lowest, but again the residents and students did not think themselves overly deficient in this area. Six neutral responses indicated that their training up to that point may not have been that complete or the individuals have had little experience and perhaps forgotten the information due to a poor reinforcement.

Statement 4: I think that a mediated instructional material would help me or someone else improve their comprehension of this topic outside of experience and a normal text on the subject.

1 Neutral, 6 Agreed, 4 Strongly Agreed

This statement was designed to inquire if the target population felt that they could learn more outside of the materials they were already using and thus demonstrate a deficiency, at some level, in the current material. Overall, there was a positive attitude toward a mediated instructional resource. This statement received a broader range of answers, but the general response seems to suggest that the area for most improvement would have to be in the surgical principles and repair process. This is speculated to be the case since statement three received the most neutral response out of the first three statements.

Statement 5: I think that a video format is a good way to receive this information.

1 Disagreed, 1 Neutral, 7 Agreed, 2 Strongly Agreed

This statement was designed to determine if the residents and students preferred learning information (not necessarily this information) through an audio-visual experience such as a DVD. Overall the response was fairly positive, but with a pool this size 1 Disagree is significant. The same individual gave a positive response for the previous statement. Perhaps a video is not flexible enough to accommodate all learning styles.

Statement 6: After watching this video I have a thorough understanding of female pelvic anatomy.

5 Agreed, 6 Strongly Agreed

Statements six through eight were follow-up questions to the first three statements of this evaluation, and were designed to measure if any learning had occurred. The responses indicate that there was an improvement since 6 original Agreements changed into Strong Agreements from statement 1.

Statement 7: After watching this video I have a thorough understanding of the classifications of perineal lacerations.

1 Agreed, 10 Strongly Agreed

This statement received a dramatic positive response. This provides some support that the classification section of the video provided additional information or clarification to an already knowledgeable group.

Statement 8: After watching this video I have a thorough understanding of the surgical principles and repair process of a fourth degree laceration.

2 Agreed, 9 Strongly Agreed

As with the previous two similar statements, this statement received a positive response. When compared to statement 3, it can be assumed that the content provided educated a somewhat knowledgeable group. This also indicates that most of the learning occurs in this section of the video.

Statement 9: I think that the illustrations and animations were clear and helpful

1 Agreed, 10 Strongly Agreed

Based on the responses, it can be assumed the illustrations and animations were an important facet of the video. No additional comments from the viewers were surprising. The style and license taken with the anatomy did not appear to hinder the visual experience.

Statement 10: I think that the OR video and stills were understandable without the interpretation of an illustration.

5 Disagreed, 1 Agreed, 5 Strongly Disagreed

This statement had multiple intents. First, this statement switched the order of expected responses. Up to this question most of the responses were expected to be in general agreement. This question was designed to interrupt that flow to test the validity of responses from the survey. The second intent was to glean whether illustrations were a necessary part of the video. If the OR footage and stills were clear, then illustrations may not be necessary which would contradict statement 9 to some extent. The responses of this statement are inconclusive. When measured against the first intent of this question the validity of the answers are questionable. Approximately half did feel that the OR media was confusing. One individual stated, “*OR videos were confusing*”. This type of response came almost exclusively from the medical students. Perhaps the residents’ level of experience allowed them to understand the OR media more clearly. This statement may have also been confusing and thus skewed the answers.

Statement 11: I think that a different format (such as an interactive program), where the content is broken down into separate modules, would provide easier access to the more practical content of this video.

2 Disagreed, 6 Neutral, 1 Agreed, 2 Strongly Agreed

This statement was a follow up statement (from statement 5) to see if the viewers still felt a video format was a favorable one. The response was mostly a neutral one with a slightly positive lean. An interactive program or other resource would only provide an

outlet for a different learning style and not necessarily be a better way to present the information. Though, it may provide easier access to specific content within the video. This could only be determined if a similar project was presented alongside this project and the two were evaluated together.

Statement 12: I would view this again to help review the information or prepare for surgery

3 Agreed, 8 Strongly Agreed

From the overwhelming positive response to this statement it can be determined that the video was relevant and educational and fulfilled the objectives of the project. The responses also indicate that the information may be relevant to groups outside of the target audience, such as fourth year medical students.

Additional Comments

Almost no additional comments were stated even though plenty of space was provided. One medical student wrote:

“OR videos were confusing.”

This statement could be interpreted to mean that OR video was confusing because the person did not understand without the interpretation of illustrations or animations, or that the OR video was poorly edited and jumped to often because of the time constraints of the video.

CHAPTER FIVE

Conclusions and Recommendations

Project Summary

The thesis research problem that this project attempted to solve was the scarcity of good instructional resources available to first year OBGYN residents on the anatomic subtleties of female pelvic anatomy, a good perineal laceration classification system, and detailed walkthrough of a fourth degree repair. To solve this problem, a goal was established. The goal of this thesis project was to create an instructional DVD video that would provide information on female pelvic anatomy, a classification system for perineal lacerations, and a detailed step by step approach to repairing a fourth degree laceration with proper surgical principles.

In order to meet this goal several objectives were met. I worked very closely with Marlene M. Corton M.D. and Shayzreen M. Roshanravan M.D. to research, produce, and edit the final DVD. Another objective this project met was the creation of all media required for this version of the video. Over thirty detailed illustrations and two animations were created to meet this objective; in addition to the extra media provided by the content advisors. The final objective met was to edit the video together and present it to OBGYN residents to review its effectiveness. Seven OBGYN residents and four fourth year medical students

were shown the video and given surveys. All eleven individuals completed the survey.

Discussion

Overall there was a positive response toward the video and the media contained there in. The majority of the respondents seemed confident in their pre-video knowledge; they all expressed a perceived increase in comprehension of the subject matter. This suggests that the thesis project successfully met its goal. Based on the responses from statement 9, the illustrations seemed to have made a positive impact with the audience. However this almost seems contradicted by the responses in statement 10. Possible explanations for this contradiction could be argued: 1) the statement itself may have been unclear or confusing 2) the range of experience this test group was too broad 3) statement 9 should have only been about the utility of the media and left out the “clarity” part. Statements 5, and 11, were designed to specifically ascertain how the target audience preferred to receive their information. A majority seemed pleased with the video format while a majority seemed neutral regarding the superiority of an interactive based program. Since this survey did not examine actual retention of information, it is inconclusive if another format could communicate the information in a better way.

Suggested Area for Further Research

In a future study the population would have to be greatly increased to evaluate the true effectiveness this resource. The small sampling in this thesis indicated the probability of increased learning, however in order to test the true effectiveness of this resource a much larger randomized population would have to be sampled.

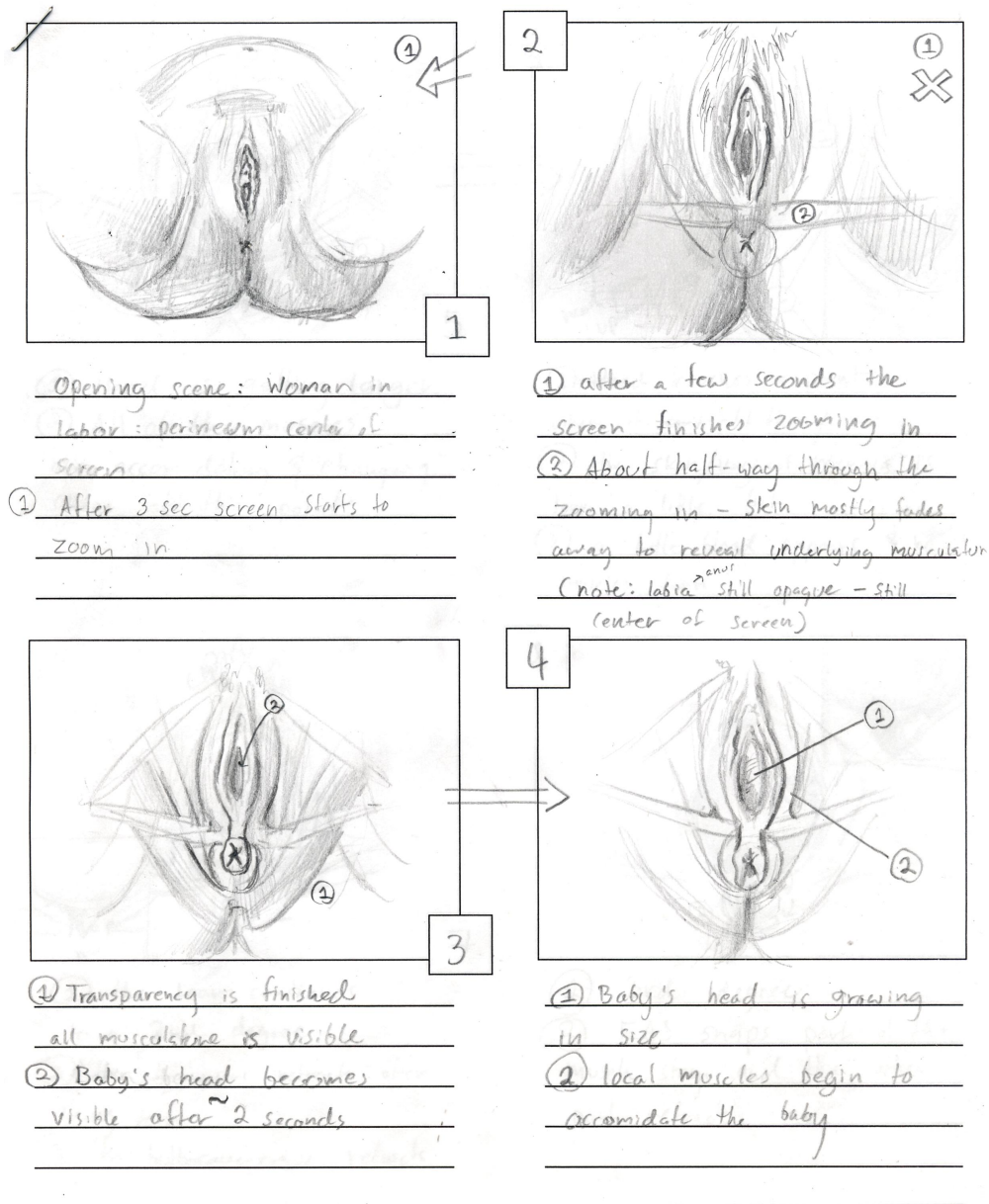
Based on the inconclusive responses from the surveys, it has yet to be determined what type of format residents and students prefer when receiving mediated instruction. As an area of further research a study could be conducted to compare formats and determine which format provides for a higher rate of retention of information. All of the media used in this project could be placed in a modular based interactive program with simple tests at the end to reinforce the information. Then a study with a larger survey group could be established so that the target audience would interact with both formats and a conclusive comparison could be reached.

An additional area of research would be regarding the clarity of OR footage. Based on the responses from Statement 10 it is also inconclusive at this

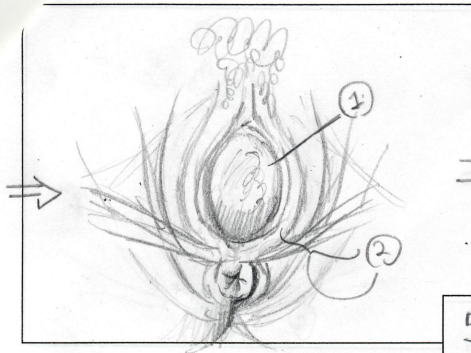
juncture if illustrations and animations are necessary to clarify OR video and stills. An exam could be conducted to see if residents can identify and comprehend OR media without illustrated aids.

APPENDIX A

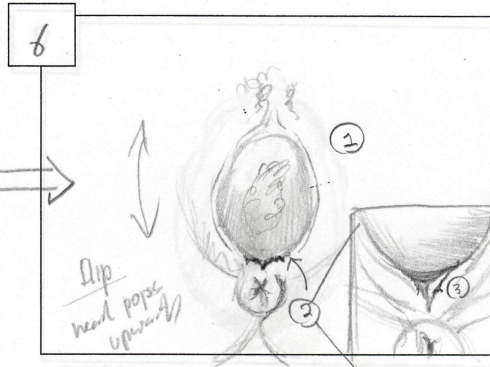
Storyboard for the *Vaginal Birth with Tearing Animation*



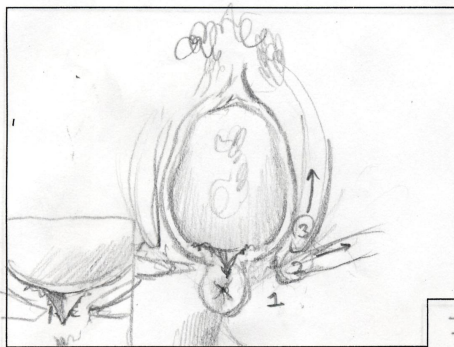
Jordan Pietz Thesis-birth animation 10-22-07



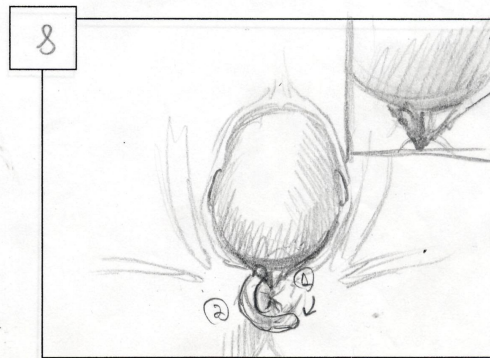
- ① Head is getting larger
- ② All of the muscles are accommodating & changing shape at this point



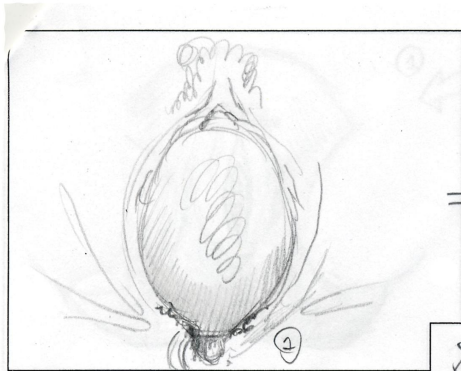
- ① Head reaches a point where it can't fit through skin
- ② the skin/vaginal mucosa is torn a little bit
- ③ a little blood appears & no muscles torn



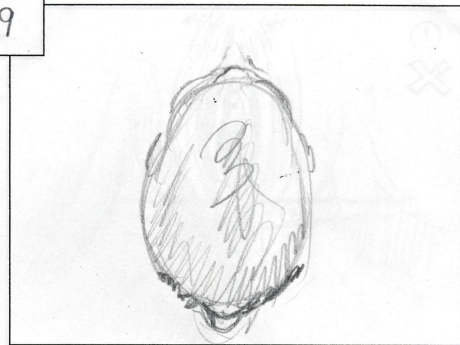
- ① the tear continues to a 2nd degree
- ② the transvers retracts after being torn
- ③ the bulbocavernosus retracts



- ① 3rd degree
- ② EAS snaps part of the muscle stays and the other part retracts



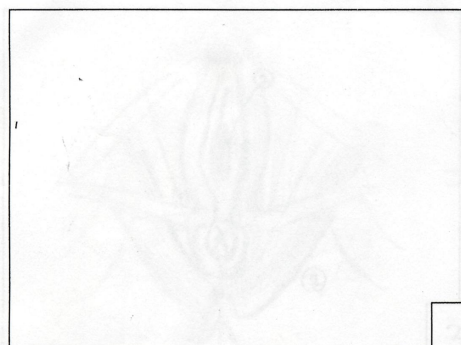
9



8

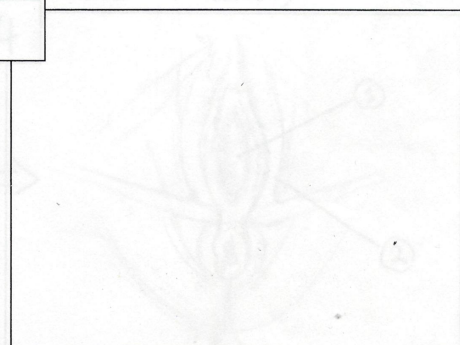
① 4th degree
cloaca formed.

② Baby's head is through
the cloacal hole.



3

4



APPENDIX B

Evaluation Survey

AN INSTRUCTIONAL VIDEO TO TEACH THE ANATOMY, CLASSIFICATION, AND REPAIR OF A FOURTH-DEGREE PERINEAL LACERATION

INSTRUCTIONS: Please circle the number that corresponds most with your attitude toward the statement. *Strongly Disagree* is valued at 1, *Neutral* is valued at 3, *Strongly Agree* is valued at 5. Space for additional comments is available after each question.

*Please answer questions 1-5 before viewing the video
Then complete questions 6-12 after viewing the video on the back page.*

1 - I have a thorough understanding of female pelvic anatomy:

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

comments:

2 - I have a thorough understanding of the classifications of perineal lacerations:

1	2	3	4	5
---	---	---	---	---

comments:

3 - I have a thorough understanding of the surgical principles and repair process of a fourth-degree laceration:

1	2	3	4	5
---	---	---	---	---

comments:

4 - I think that a mediated instructional material would help me or someone else improve their comprehension of this topic outside of experience and a normal text on the subject:

1	2	3	4	5
---	---	---	---	---

comments:

5 - I think that a video format is a good way to receive this information:

1	2	3	4	5
---	---	---	---	---

comments:

Continue on to the next page after viewing the video >

6 - After watching this video I have a thorough understanding of female pelvic anatomy:

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

comments:

7 - After watching this video I have a thorough understanding of the classifications of perineal lacerations

1	2	3	4	5
---	---	---	---	---

comments:

8 - After watching this video I have a thorough understanding of surgical principles and the repair process of a fourth-degree laceration:

1	2	3	4	5
---	---	---	---	---

comments:

9 - I think that the illustrations and animations were clear and helpful:

1	2	3	4	5
---	---	---	---	---

comments:

10 - I think that the OR video and stills were understandable without the interpretation of an illustration:

1	2	3	4	5
---	---	---	---	---

comments:

11 - I think that a different format (such as an interactive program), where the content is broken down into separate modules, would provide easier access to the more practical content of this video:

1	2	3	4	5
---	---	---	---	---

comments:

12 - I would view this again to help review the information or prepare for surgery:

1	2	3	4	5
---	---	---	---	---

Additional Comments:

THANK YOU FOR YOUR TIME!

APPENDIX C

Evaluation Survey Responses

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*Please answer questions 1-5 before viewing the video
Then complete questions 6-12 after viewing the video on the back page.*

1 - I have a thorough understanding of female pelvic anatomy:

Strongly Dissagree	Dissagree	Neutral	Agree	Strongly Agree
1	2	3	(4)	5

comments:

2 - I have a thorough understanding of the classifications of perineal lacerations:

1	2	3	(4)	5
---	---	---	-----	---

comments:

3 - I have a thorough understanding of the surgical principles and repair process of a fourth-degree laceration:

1	2	3	(4)	5
---	---	---	-----	---

comments:

4 - I think that a mediated instructional material would help me or someone else improve their comprehension of this topic outside of experience and a normal text on the subject:

1	2	3	(4)	5
---	---	---	-----	---

comments:

5 - I think that a video format is a good way to receive this information:

1	2	3	4	(5)
---	---	---	---	-----

comments:

Continue on to the next page after viewing the video >

6 - After watching this video I have a thorough understanding of female pelvic anatomy:

Strongly Dissagree	Dissagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

comments:

7 - After watching this video I have a thorough understanding of the classifications of perineal lacerations

1	2	3	4	5
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comments:

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Additional Comments:

THANK YOU FOR YOUR TIME!

AN INSTRUCTIONAL VIDEO TO TEACH THE ANATOMY, CLASSIFICATION, AND REPAIR OF A
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comments:

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Additional Comments:

THANK YOU FOR YOUR TIME!

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Additional Comments:

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THANK YOU FOR YOUR TIME!

4

**AN INSTRUCTIONAL VIDEO TO TEACH THE ANATOMY, CLASSIFICATION, AND REPAIR OF A
FOURTH-DEGREE PERINEAL LACERATION**

INSTRUCTIONS: Please circle the number that corresponds most with your attitude toward the statement. *Strongly Dissagree* is valued at 1, *Neutral* is valued at 3, *Strongly Agree* is valued at 5. Space for additional comments is available after each question.

*Please answer questions 1-5 before viewing the video
Then complete questions 6-12 after viewing the video on the back page.*

1 - I have a thorough understanding of female pelvic anatomy:

Strongly Dissagree	Dissagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

comments:

2 - I have a thorough understanding of the classifications of perineal lacerations:

1	2	3	4	5
---	---	---	---	---

comments:

3 - I have a thorough understanding of the surgical principles and repair process of a fourth-degree laceration:

1	2	3	4	5
---	---	---	---	---

comments:

4 - I think that a mediated instructional material would help me or someone else improve their comprehension of this topic outside of experience and a normal text on the subject:

1	2	3	4	5
---	---	---	---	---

comments:

5 - I think that a video format is a good way to receive this information:

1	2	3	4	5
---	---	---	---	---

comments:

Continue on to the next page after viewing the video >

6 - After watching this video I have a thorough understanding of female pelvic anatomy:

Strongly Dissagree	Dissagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

comments:

7 - After watching this video I have a thorough understanding of the classifications of perineal lacerations

1	2	3	4	5
---	---	---	---	---

comments:

8 - After watching this video I have a thorough understanding of surgical principles and the repair process of a fourth-degree laceration:

1	2	3	4	5
---	---	---	---	---

comments:

9 - I think that the illustrations and animations were clear and helpful:

1	2	3	4	5
---	---	---	---	---

comments:

10 - I think that the OR video and stills were understandable without the interpretation of an illustration:

1	2	3	4	5
---	---	---	---	---

comments:

11 - I think that a different format (such as an interactive program), where the content is broken down into separate modules, would provide easier access to the more practical content of this video:

1	2	3	4	5
---	---	---	---	---

comments:

12 - I would view this again to help review the information or prepare for surgery:

1	2	3	4	5
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Additional Comments:

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comments: OR videos were confusing.

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1 2 3 4 5

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VITAE

Jordan Taylor Pietz was born in Mesa, Arizona December 22nd, 1982 to Mark B. Pietz and Linda L. Pietz. Brother of Priscilla, Jordan was raised in Southern California and then in St. Louis during his high school years. Jordan was home-schooled all through his pre-college education. It was during this time he acquired a taste for science and developed his skill as an artist. In the Fall of 2001, Jordan was admitted to Concordia University in Seward, Nebraska where he studied biology with the intent of becoming a doctor. During the summer before his senior year, Jordan enrolled as an intern in the Nebraska BRIN program to do research. It was at this point he realized he would rather draw science, than do it. Jordan graduated with honors from Concordia in May 2005. He entered the Biomedical Communications Program at UT Southwestern Medical Center in Dallas a few weeks after graduation. Jordan was awarded the degree of Master of Arts in Biomedical Communication in December 2007.

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