Research Report

Impact of transrectal palpation on teaching mares: a retrospective study*

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Abstract

Transrectal palpation (TRP) in mares is considered a noxious and potentially life-threatening procedure, particularly if performed by inexperienced individuals. A retrospective study was conducted using TRP records maintained at the Oklahoma State University College of Veterinary Medicine Ranch. A total of 5,801 TRP were performed from 2019 to 2021 by veterinary students. We hypothesized that in mares the incidence of rectal wall injury and use of intravenous sedation for behavior modification would be low. Additionally, we hypothesized that averse behaviors during TRP would not be a reason commonly cited for mare retirement from the teaching herd. Injury incidence rate was 0.76% (44/5,801) and no injury required surgical correction or resulted in a mare's death. Sedation was used to minimize averse behaviors 0.34% of the time (20/5,801) and 11 out of 48 mares received sedation. Individual mare use ranged from 1 to 22 years and 10 of 48 mares retired from 2019 to 2021. No retirement was related to averse behaviors or injury experienced during TRP. Findings indicated that student-generated rectal wall injury to teaching mares was at an extremely low rate of occurrence. We also suggest that in live-animal TRP laboratories, animal welfare is not compromised, and it should not be cited as a reason to minimize live animal use within the veterinary curriculum.

Keywords: Transrectal palpation, behavior, injury, attrition rate

Introduction

Historically, transrectal palpation (TRP) of mares by students was commonplace; however, recently, the practice has been minimized at many veterinary schools across the United States due to the potential rectal injury and animal welfare concerns. Such a risk of injury to the rectal wall has been a reason for teaching institutions to reconsider the use of institution-owned teaching animals and replacing live animal laboratories with model simulators. There is an increasing use of model simulators and replacement of live animal laboratories to teach veterinary students in response to these concerns. However, removal of live animals from the veterinary curriculum would substantially minimize the amount of real-life experience to veterinary students.

'Hands-on training involving animals is an important component of agricultural research and teaching; additionally, there is no substitute of another animal or simulation for production research'.[1] The clinical skill of TRP is critical for large animal veterinarians, not only in breeding management, but also in pregnancy diagnosis and workup of cases of colic. A few reports documented the level of risk or safety of TRP when included in the veterinary curriculum. However, a recent study concluded that there were no rectal injuries due to TRP and ultrasonographic examination in recipient mares by students who had received 6 weeks of training. None of the mares experienced any pathological condition, including any degree of rectal injury, and specific therapy was never deemed necessary after students' palpations.[2]

Animal welfare is an important aspect to consider when live animals are used for teaching and anything that can be done to improve this for the teaching animals should be considered. However, recent studies have begun to determine how stressful TRP is in mares. Transrectal palpation examinations induced a moderate stress response indicated by increased heart rate and cortisol release. However, frequency of the TRP was the main stressor and TRP every 6 hours substantially increased the mares' heart rates.[3] Results from 2 other studies also demonstrated that the cortisol response from TRP was lower than horses that were transported and was lower in

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mares that experienced student TRP compared to mares standing undisturbed in palpation stocks.[3,4,5]

Our institution prides itself on the ability to prepare students for day 1 of veterinary practice. Through hands-on laboratories, students are allowed to implement the skills and knowledge that they have acquired in the classroom setting and apply it directly to live animals. This study had 3 objectives: 1. identify the incidence of mare rectal injury associated with TRP in teaching mares, 2. identify the number of intravenous sedation utilized for averse behaviors (i.e. behaviors interpreted as 'dislike'), and 3. identify the length of individual mares' use/cited reasons for retirement.

Materials and methods

Transrectal palpation records (2019–2021) from the Oklahoma State University College of Veterinary Medicine Ranch. During this period, the ranch had 48 teaching mares and their ages ranged from 4 to 26 years. The herd had several breeds (Quarter Horses, Paints, Thoroughbreds, and 1 Friesian Sport Horse). Data were collected from 2nd and 3rd year laboratory courses, senior student clinical rotations, and other student teaching opportunities. Laboratories and clinical rotations were limited to a maximum of 6 students per session under the supervision of a clinician, resident, and intern. Second and 3rd year laboratory is an elective class open to all students with varying degrees of horse experience, and transrectal palpation and ultrasonography experience. This elective allowed for an introduction and ability to learn the basic skills of TRP, ultrasonography, and equine theriogenology. Clinical rotations are offered throughout the breeding season wherein senior veterinary students gained experience with TRP and were allowed to track individual mares throughout their estrous cycle while performing a wide range of reproductive procedures including breeding soundness examinations and mock embryo flushes. Veterinary students transrectally palpated and performed ultrasonography of the reproductive tracts of mares through all stages of pregnancy. The teaching mares were used throughout the year for miscellaneous laboratories and various teaching purposes. Documented mare injuries from transrectal palpation included any amount of blood on rectal sleeves and any degree of rectal wall tearing/compromise. Individual mare medical records documenting date of entry into the teaching herd, date of retirement, and the reason for retirement were analyzed.

Although not the first method selected to quiet an agitated mare, our approved institutional animal care and use committee teaching protocol allowed for the use of sedation on a case-by-case basis in mares displaying averse behaviors to ensure mare and student safety. Listed averse behaviors were excessive pawing or reluctance to stand still in the stocks in such a way that safety was compromised. Mares were sedated intravenously with either 100 mg xylazine (Anased, Patterson Veterinary, Loveland, CO), 200 mg acepromazine maleate (Acepromazine, MWI Animal Health, Boise, ID), or 1.5 – 5 mg detomidine hydrochloride (Dormosedan, Zoetis, Parsipanny, NJ) depending on the mare and her behavior.

The standing IACUC protocol allowed a maximum of 5 transrectal examinations in a mare per laboratory and a maximum of 3 laboratories per week. Therefore, it was possible to transrectally palpate each mare a maximum of 15 times in a 7-day period. If at any point a mare had mucosal irritation (blood on palpation sleeve), she was removed from the palpation herd for a minimum of 2 weeks. If there is any indication of a rectal tear or injury, that mare was thoroughly evaluated by a veterinarian and appropriate steps were taken to treat the mare as needed.

Results

Total number of palpations by veterinary students from 2019 to 2021 were 5,801. Forty-four mare rectal injuries (Table 1) occurred, and the injury rate was 0.76% (44/5,801). None of the injury required surgical correction or resulted in death of a mare. The injuries consisted of mucosal irritation/abrasions, as evidenced either by blood on the examination sleeves, visual or digital identification of a tear, or both; defects to the rectal wall were not higher than minor Grade 1 rectal tear ≤ 2 cm in length. Injuries occurred in 28/48 mares with 12 of these mares had multiple injuries throughout the years. Sedation was used in 0.34% (20/5,801) times and 11 of 48 mares received sedation. Sedation was given on multiple occasions to 5 mares, and 1 mare needed sedation 6 times from 2019 to 2021 (Table 2). Individual mare use ranged from 1 to 22 years and 10 of 48 mares retired from 2019 to 2021. No retirement was related to averse behaviors or injury experienced during TRP (Table 3). Retirement or reasons teaching mares left the herd included humane euthanasia, vascular injury, aging out of program, or enrolled in a research project.

Discussion

Based on these data there was a low rate of injury to teaching mares from TRP by veterinary students. None of the injuries that occurred in the teaching mares required surgical correction or resulted in full-thickness rectal wall tears. Depending on the extent of mare's injury, mares were removed from the teaching herd to recover and treated appropriately. There was no injury that resulted in a mare's death or retirement from the teaching herd. This low rate was observed with inexperienced students and with inexperienced mares that entered the herd during this period that were new to TRP. There has been concern, particularly in cattle, that inexperienced students transrectally palpating the uterus may cause pregnancy loss; however, there was not an increased risk of pregnancy loss when students performed TRP on cattle that were early in pregnancy.[6] Students came with a wide range of experience, some might have palpated a mare for the first time during these laboratories whereas more experienced students were able to follow the whole reproductive tract on transrectal ultrasonographic examination. Although injuries occurred during TRP, it was observed that under our conditions they were infrequent and evidence of common injuries observed (e.g., blood on the sleeve) were manageable with full recovery of the mare. Authors observed that students were readily willing to self-report evidence of injury to a mare, knowing that there was also no cause for concern of reprimand, to ensure that the mare received an appropriate examination by the veterinarian present.

Intravenous sedation was used infrequently for the modification of averse behaviors in mares. Not all mares needed sedation for TRP and it was observed that mares that received sedation did not need it consistently. One could postulate that we selected among donated mares only those with good personalities or trained mares; however, we did not choose mares. All mares were donated. Mares came with a variety of training

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Table 1. Total times teaching mares were transrectally palpated by veterinary students from 2019 to 2021 and the injuries that occurred from transrectal palpation

Mare/year	2019	2020	2021	Total	Injuries
610	16	6	145	167	
187	0	0	103	103	
165	26	47	69	142	
158	18	39	62	119	Mucosal irritation 6/15/2020, rectal bleeding 8/24/2020
181	0	45	127	172	
173	32	2	85	119	
136	31	0	0	31	Blood on sleeve 8/28/2019
59	8	70	88	166	
190	0	0	91	91	
178	11	79	113	203	Small rectal tear 10/19/2021, rectal abrasion 10/25/2021
953	32	42	98	172	Blood on sleeve 2/11/2020
130	24	0	0	24	
168	21	67	0	88	Blood on sleeve 8/27/2019, 9/3/2019, 3/2/2020
344	7	35	49	91	
188	0	0	119	119	Blood on sleeve 5/25/2021
184	0	46	123	169	Blood on sleeve 2/22/2021
177	4	21	0	25	Blood on sleeve 3/2/2020
163	28	72	80	180	
182	5	27	5	37	
180	11	17	55	83	Blood on sleeve 6/4/2021
191	0	0	3	3	
121	7	15	53	75	
123	12	39	87	138	Small rectal tear 0.5 cm 9/10/2019, blood on glove 11/1/2021
157	19	68	89	176	Rectal scratch 1/2 inch 3/20/2019, blood on sleeve 2/6/2020
125	39	55	54	148	Blood on glove 5/27/2021
156	1	69	88	158	
172	15	83	120	218	
171	28	66	151	245	
186	0	0	119	119	Blood on sleeve 3/1/2021
143	2	19	9	30	Blood on sleeve 2/24/2020
28	14	71	107	192	Small rectal tear 8/31/2021
18	7	63	103	173	Mucosal roughening 4/22/2019, blood on sleeve 3/2/2020, blood on sleeve 5/20/2020, rectal irritated 8/21/2020
146	22	60	43	125	Blood on sleeve 6/3/2021, small rectal tear 9/13/2021
678	11	0	0	11	Blood on sleeve 8/27/2019
142	19	63	114	196	Blood on sleeve 4/29/2021
179	18	46	85	149	Small tear 1 cm long 8/23/2019, blood on sleeve 2/27/2020, blood on sleeve 3/23/2021
919	32	44	12	88	Blood on sleeve 8/23/2019, 8/27/2019
167	19	50	79	148	
183	20	41	107	168	Blood on sleeve 2/22/2021
135	13	63	80	156	
898	47	7	0	54	Small superficial tear 4/5/2019, blood on sleeve 2/12/2020
122	10	53	12	75	
0	0	0	18	18	Small rectal abrasion 10/11/2021
155	14	61	108	183	Blood on glove 10/25/2021, 11/2/2021
166	18	55	84	157	Small rectal abrasion 8/31/2021
185	2	16	137	155	Blood on sleeve 6/21/2021
835	20	48	61	129	
169	13	0	0	13	1 cm rectal tear partial thickness 5/16/2019, blood on sleeve 6/6/2019
			Total	5,801	Total incidents = 44

Table 2. Number of times teaching mares were transrectally palpated by veterinary students from 2019 to 2021 and the amount of sedation and times sedation utilized for averse behaviors

Mare/year	2019	2020	2021	Total	Sedation needed
610	16	6	145	167	
187	0	0	103	103	1 ml Xylazine 3/16/2021
165	26	47	69	142	
158	18	39	62	119	
181	0	45	127	172	
173	32	2	85	119	Dorm 0.3 ml 10/5/2021 for lab, Dorm 0.3 ml 14 d preg check 6/14/2019
136	31	0	0	31	Dorm 0.3 ml 10/8/2019 for BSE
59	8	70	88	166	
190	0	0	91	91	
178	11	79	113	203	
953	32	42	98	172	
130	24	0	0	24	
168	21	67	0	88	Dorm 0.3 ml for biopsy 6/5/2020
344	7	35	49	91	Dorm 0.3 ml for palp 8/20/2021, Dorm 0.3 ml for palp 9/21/2020, 9/14/2020, 8/31/2020, Ace 2 ml for palp 8/31/2020, Dorm 0.4 ml 10/7/2019 for BSE
188	0	0	119	119	Dorm 0.3 ml for palp 10/5/2021, Xylazine 1 ml 3/16/2021
184	0	46	123	169	
177	4	21	0	25	
163	28	72	80	180	
182	5	27	5	37	
180	11	17	55	83	
191	0	0	3	3	
121	7	15	53	75	
123	12	39	87	138	
157	19	68	89	176	
125	39	55	54	148	
156	1	69	88	158	
172	15	83	120	218	
171	28	66	151	245	
186	0	0	119	119	Xylazine 1 ml 3/16/2021, Dorm 0.5 ml 2/19/2021 for lavage
143	2	19	9	30	
28	14	71	107	192	
18	7	63	103	173	
146	22	60	43	125	
678	11	0	0	11	
142	19	63	114	196	Dorm 0.5 ml for lavage post embryo aspiration 3/24/2021
179	18	46	85	149	
919	32	44	12	88	
167	19	50	79	148	
183	20	41	107	168	
135	13	63	80	156	
898	47	7	0	54	Dorm 0.4 ml for BSE 10/7/2019, Dorm 0.15 ml for BSE 5/24/2019
122	10	53	12	75	
0	0	0	18	18	Dorm 0.3 ml 10/5/2021
155	14	61	108	183	
166	18	55	84	157	
185	2	16	137	155	
835	20	48	61	129	
169	13	0	0	13	Dorm 0.3 ml for 6/7/2019
			Total	5,801	Total times sedation was utilized: 20

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Table 3. Teaching mares summary (age, breed, joining date, and reasons for leaving)

Mare	Birth date	Breed	Joined herd	Euthanized/left program
610	1/1/2008 – 14 years	QH	2016	
187	4/15/2017 – 4.8 years	PAINT	2020	
165	2/6/2002 – 19.9 years	PAINT	2017	
158	4/18/1999 – 22.8 years	AQHA	2016	
181	8/6/2004 – 17.5 years	AQHA	2019	
173	3/7/2007 – 14.9 years	AQHA	2017	
136	1/1/2003 – 19 years	AQHA	2010	Euthanized for RR lameness 1/23/2020
59	1/1/2003 – 19 years	APHA	2015	
190	1/1/2009 – 13 years	PAINT	2020	
178	5/7/2003 – 18.7 years	AQHA	2018	
953	3/3/2000 – 21.9 years	AQHA	2007	
130	3/25/2005 – 16.8 years	AQHA	2010	Euthanized 7/25/2019 for lameness
168	5/20/1996 – 25.7 years	AQHA	2017	Euthanized 11/9/2020 for lacerations
344	4/30/2005 – 16.7 years	AQHA	2019	Euthanized 8/20/2021, jumped through window
188	4/3/2017 – 4.8 years	PAINT	2020	
184	5/22/2008 – 13.7 years	Friesian Sport Horse	2019	
177	2/27/2004 – 17.9 years	TB	2018	Retired due to age/hard keeper 4/13/2020
163	4/4/2008 – 13.8 years	TB	2017	
182	4/12/2008 – 13.8 years	AQHA	2019	
180	3/15/2008 – 13.8 years	AQHA	2019	
191	1/1/2018 – 4 years	AQHA	2021	
121	5/10/2000 – 21.7 years	AQHA	2009	
123	3/26/2005 – 16.8 years	AQHA	2009	
157	2/28/2002 – 19.9 years	AQHA	2016	9/28/2021 Ruptured cranial mesentery artery
125	4/14/2003 – 18.8 years	AQHA	2009	
156	5/12/2003 – 18.7 years	QH	2016	
172	3/23/2011 – 10.8 years	APHA	2017	
171	4/10/2010 – 11.8 years	APHA	2017	
186	1/1/2017 – 5 years	PAINT	2020	
143	3/31/2010 – 11.8 years	AQHA	2012	
28	3/25/2011 – 10.8 years	AQHA	2018	
18	4/11/2012 – 9.8 years	AQHA	2018	
146	5/6/1999 – 22.7 years	TB	2013	
678	1/1/2000 – 22 years	AQHA	2009	Euthanized for lameness 10/23/2019
142	1/1/2004 – 18 years	QH-Appy X	2012	
179	4/12/2000 – 21.8 years	AQHA	2019	
919	5/21/2000 – 21.7 years	AQHA	2005	Euthanized 7/6/2021 found down in pasture
167	1/1/1998 – 24 years	AQHA	2017	
183	1/1/2002 – 20 years	AQHA	2019	
135	4/19/2005 – 16.7 years	AQHA	2010	
898	3/5/2001 – 20.9 years	TB	2004	Retired due to age 4/13/2020
122	2/26/2005 – 16.9 years	AQHA	2009	
0	9/10/2013 – 8.3 years	QH	2020	
155	5/4/2004 – 17.7 years	AQHA	2015	
166	1/6/2007 – 15 years	AQHA	2017	
185	2/22/2007 – 14.9 years	AQHA	2019	
835	4/1/1995 – 26.8 years	AQHA	2002	
169	1/1/2012 – 10 years	TB	2017	Left for research project 9/30/2019

and handling. Some were older and used as riding companions and some were young 4-year maidens that were only halter-broken. To help acclimate new mares to the palpation herd, we routinely brought them into the palpation barn and into the stocks where we initially allowed them to just get used to standing in the stocks. Students may groom the mares while they stand and pet them for positive reinforcement. Slowly they were introduced to TRP and each mare was allowed to progress at her own rate. All mares were eventually placed in the palpation herd without issue.

It could be perceived that observed averse behaviors were due to dislike of the TRP procedures; however, if TRP was a noxious procedure, one would expect teaching mares to progressively develop aversion to behaviors and require increased use of sedation. This was not demonstrated in our herd. A plausible cause for such behaviors aside from the TRP procedures themselves is the period it took for students to palpate. The period mares stood in the stocks could influence their behavior, especially if they had sore feet or arthritis that could be causing them discomfort. To try to relieve this, we installed rubber mats for the mares to stand on in the stocks that provided a limited amount of comfort from the concrete floors. Potential causes for averse behaviors were mares being separated momentarily from their 'buddies,' boredom, or mittelschmerz (ovulatory pain, Merriam-Webster). This could explain why some mares needed sedation multiple times depending on the day and since they did not need sedation every time they were palpated.

Research is underway to identify the stress response from TRP in mares. Teaching mares had the lowest cortisol concentrations and there was no major disturbance in mare's welfare.[7] Teaching horses may be accustomed to these procedures since there was low heart rates and no increase in stress responses.[8] As TRP began, mean pony mare heart rate was 32.46 ± 4.83 beats per minute (bpm) and after 4 minutes of TRP, the mean heart rate was 34.6 ± 11.80 bpm; heart rates increased after TRP while waiting in stocks for a longer period than usual after palpation procedure.[5] With these results, one could consider that the act of TRP may not be a primary stressor and perhaps stressors (e.g., duration a mare is actively palpated, duration a mare is standing in confinement stocks, or simply a deviation from normal routine had a larger role). Another study by the same author determined salivary and fecal glucocorticoid metabolites concentrations. Author concluded that mares accustomed to palpation did not activate their hypothalamic-pituitary-adrenal axis during student palpations.[9] Further research is needed to identify exactly how stressful TRP is to teaching mares and to identify various stress factors.

We examined individual mare records to determine if there were mares retired from the teaching herd due to averse behaviors or TRP-associated injury. No mares retired from the teaching herd because of averse behaviors or injury. We recognize that TRP can certainly result in an injury (e.g., rectal tear or serious rectal injury) leading to retirement or death of a mare.

A study[10] compared student proficiencies from live-animal based learning versus simulator learning in which students who trained repeatedly on horses performed better than simulator trained students in both TRP and ultrasonographic examination. Another study focusing on TRP for pregnancy diagnosis in cattle observed that student simulation training resulted in lower sensitivity in pregnancy diagnosis in cows that were < 6 months pregnant.[11] We believe that although a simulator is a great supplement to learning, the simulator cannot provide veterinary students horsemanship, reproductive tract pathology, and real-life experiences. Theoretical knowledge can be gained from reading a textbook but until it is supplemented with 'experiential knowledge,' information alone has no benefit. In laboratory sessions, students first caught mares from the herd and haltered them. This involved entering an area that had multiple horses and evaluating each horse's personality. Some mares were easier to catch than others, a valuable lesson in itself, and many of our students haltered a mare for the first time during these laboratories. Throughout this whole process from start to finish, students were working alongside the horses and learned valuable 'horse sense' obtained only through experience. Learning how to safely work with horses is a necessary skill in clinical practice for the safety of the horse and the veterinarian. Although students can learn how normal reproductive tract looks and feels like via stimulators, they will not learn normal variations and pathology of reproductive tract, a limitation of stimulators. Teaching mares' variation in age allowed students to appreciate the differences in ovaries (i.e., ovarian senescence), uterine position (i.e., pendulous uterus), and cervical function (i.e., fibrotic cervix). Throughout the season mares might have had various conditions (e.g., endometritis) wherein students themselves were able to identify the condition via ultrasonography, obtained culture samples from the mare themselves, and treated accordingly. Witnessing and participating in this diagnostic work-up and treatment process matched what students will experience in clinical practice. With a teaching herd on site, not only will students have the opportunity to practice reproductive procedures, but also had opportunities to use their knowledge and practice their clinical skills in other areas of equine veterinary medicine. For example, if a teaching mare had ocular discharge or walked up to feed bin with a sudden lameness, under clinician supervision students performed diagnostics and provided treatments. These experiences cannot be accomplished with a simulator, and these are critical skills that will allow veterinary students to be properly prepared when they are in practice.

This study supported the concept that students improve their TRP skills via teaching mares. These data indicated that while injuries can occur, they occur at a very low rate at which most are not as serious as previously believed. Transrectal palpation did not appear to be a noxious procedure where increased use of sedation is needed in response to averse behaviors. Instead, most mares became acclimated to the procedures and did not needed sedation over time. None of the mares in the teaching herd retired or were removed due to injury or averse behaviors indicating that mares became acclimated to the procedures. This does not mean life-threatening injuries are impossible, just that they are infrequent. Although simulators in the veterinary curriculum serve as an adjunct to developing skills and may reduce both student anxiety and the number of live animals or repeat procedures needed in order to assure student competency, the risk of injury to the teaching mares does not preclude their use in providing real-life experiential education that is essential for development of competent and confident veterinary students.

Conflict of interest

None.

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Authors' contribution

All authors were involved in record-keeping and instruction; Sheila Megehee wrote the first draft and Candace Lyman and Reed Holyoak reviewed and edited the manuscript.

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