ACCR
American Chiropractic College of Radiology

3330 Cobb Parkway
Suite 324 #300
Acworth, GA 30101
www.accr.org

Position Statement: ***Eliminating the routine use of Gonadal Shielding when performing Lumbar & Pelvis Radiographs in the Chiropractic setting.***

Recent studies and updated imaging guidelines from several associations suggest that gonadal shielding is not necessary when performing routine lumbar/pelvis radiographs, as it provides minimal to no benefits while increasing the risk of errors and unnecessary radiation exposure. The following is justification for eliminating the use of gonadal shielding when performing lumbar/pelvis radiographs in the chiropractic setting.

Radiation dose has decreased with better technology through the years:
Historically the common practice of gonadal shielding has been used since it was introduced in the mid 1950's as a recommendation to minimize the possible potential genetic effect/mutation to reproductive tissue. This was further enforced when the FDA in 1976 placed in the US Code of Regulations that shielding should be used to protect the gonads. These recommendations were based on estimated dose measurements using technology of the time (1950's) that resulted in estimated 10-11 mGy gonadal dose in adult male patients and 4 mGy ovarian dose for females that have drastically changed in the decades since [1]. Improvement in x-ray beam filtration, x-ray generators and faster imaging receptors have all combined to reduce the gonadal dose by an estimated 95% to adult patients compared to delivery dose from those of the 1950 [2]. In infants the dose reduction has been shown to be even greater with reduction due to these advancements reaching an estimated 98% reduction compared to those of the 1950's [3].

Hereditary Risk to Humans; an updated perspective:
The focus in implementation of gonad shielding was not in the prevention of permanent sterility since it is known that in order to cause sterility the radiation required is more than 100 times that of the dose customarily used in medical imaging, with permanent sterility occurring in doses of magnitude of 3500 mGy and 2500 mGy in males and females respectively. The main reason was due to concerns of what potential genetic effects/mutation radiation may cause on reproductive tissue. However, these concerns have not come to fruition with not a single documented case of proven hereditary mutation noted in the decades of medical imaging or in the many offspring of the survivors of the atomic bomb [8 ,18, 19]. In fact, through the years the international radiation protection organization have lowered the risk weighting factor of gonadal tissue *(W_T defined as relative health detriment of an organ/tissue resulting from radiation),* on every successive revision of their tissue risk weighting factors (W_T), since 1977, with the risk of gonadal tissue now being 0.08 W_T a decrease of weighting factor of more than half of that from their publication 60 release (1990) [5,7]. This lower weighting factor value of gonads is less than the weighting factor values currently assigned to bone marrow, colon, lung, or stomach (0.12 W_T) making the justification to use gonadal shielding to protect organs with less sensitivity than other organs that have never been historically shielded (colon, bone marrow, lung, stomach) during a routine lumbar and pelvis radiograph hard to justify.

Potential Risk associated with using Gonadal Shielding:

With most healthcare related procedures and treatments there is some amount of risk associated and the use of shielding is no exception and the risk of using patient shielding should be evaluated from a risk benefit perspective. Gonadal shields protect the covered anatomy in the FOV (Field of View), by reducing the primary beam in the shadow of the shield. Historically the amount of reduction is believed to be around 90% of the primary beam if the shields are accurately placed. Accurately placed shields would constitute gonadal shields placed over the testes in males and covering the ovaries within the pelvic ring in females. Retrospective studies have documented that in most cases shields are often placed incorrectly with some studies stating a higher incidence of inappropriately placed shielding occurring in females compared to males [8, 11, 20]. This is attributed to the varying position of the ovaries in females as well as the affect the volume of the bladder has on the position of the ovaries. These fluctuations of the location of the ovaries make it difficult for consistent protection of the ovaries using gonadal shielding. In addition, even when gonadal shielding is initially properly placed patient movement during the procedure tends to displace the gonadal shields decreasing or eliminating the effectiveness. It is estimated that gonadal shields fail to properly cover the gonads 52% of the time in males and 85% in females [14]. Inappropriate placement of the gonadal shields either by fault of the radiographer or patient therefore has the potential for obscuring important anatomy that must be evaluated for an accurate diagnosis [9, 10, 11]. This action has the potential of delaying a diagnosis and possibly leading to a misdiagnosis. Additionally, this would require the need for imaging retakes thus eliminating any benefit in the use of gonadal shielding in the initial imaging.

Automatic Exposure Controls (AEC):

On newer X-ray systems gonadal shielding may be inadvertently increasing the radiation dose to the gonads on systems that use Automatic Exposure Controls (AES). AES is becoming standard practice due to its ability to greatly decrease the radiation exposure of the patient while improving quality of images and decreasing the need for repeat exposures. AES basically work on a feedback loop between the detectors and the Xray tube by constantly adjusting the beam to ensure a quality image is produced as well as to shut off the beam. The detectors automatically shut down the beam when it has received the target dose to produce the selected body part image. If the lead gonadal shield is placed within the FOV the system will drastically increase the radiation output to make up for the primary beam that is blocked by the gonadal shielding. This results in an increase exposure to the patient with some studies documenting upwards of an increase of a 25% dose than would be normally used as well as causing image degradation due to the longer exposure time [8].

Taking into consideration that in a modern practice setting radiation dose has decreased in patients undergoing lumbar and pelvis imaging via improvements is technology, the decrease weighting factor (W_T), of hereditary risk potential to ovaries and gonads as well as the potential risk associated with using gonadal shielding in todays practice environment we echo the recent recommendations and guidelines put forth by the many associations in radiology, state radiology regulatory agencies and medical imaging physics association [7, 12, 13], in stating that gonadal shielding is no longer a best practice when performing lumbar and pelvis imaging in the chiropractic setting and should only be used in selected cases where patients may refuse to obtain the imaging without it, even after being informed of the possible risk associated with their use. We further urge state radiology regulatory agencies and teaching institutions with chiropractic doctorate programs that have not updated their policy on gonadal shielding to act in modernizing their policy on the subject.