Practical Tips:

Avoiding Inversions - Intraocular Pressure Changes and Common Yoga Poses

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Core concepts

- Elevated intraocular pressure (IOP) is the most important known modifiable risk factor for glaucoma onset and progression.
- IOP increases on assuming a body position other than seated or upright.
- Yoga has become a popular practice in the western world.
- IOP increases during and following the sirsasana (headstand) posture in healthy and glaucoma subjects. Previous yoga studies have tested only the headstand position, but other common yoga positions also increase IOP.
- Four positions tested showed a significant increase in IOP in all subjects, ranging from a 20% to 73.7% increase in IOP.
- Although the effect of practicing these positions on glaucoma progression remains to be investigated, yoga practitioners should be aware of the significant increase in IOP during these common positions, especially those with severe glaucoma.

Intraocular pressure (IOP) increases on assuming a body position other than seated or upright.[1,2,3,4] This increase is directly related to the inclination of the body toward the complete inverted position.[5] IOP begins to rise upon assuming a head down position and with the body vertical, which results in doubling of the IOP [6], and IOP remains elevated as this position is maintained.[7,8] The extent of IOP fluctuations are correlated to the change of position based on angle (ninety degrees upright or inverted) and the length of time maintained.[5,6,8]

Postural yoga (asanas), including headstand posture (sirsasana), is, along with breathing exercises (pranayama) and meditation (dhyana), one of the three basic components of hatha yoga. Yoga has become a popular practice in the western world. In 1998 an estimated 15 million American adults had performed yoga at least once.[9] Studies have shown an increase in IOP during and following sirsasana (headstand) posture in healthy and glaucoma subjects.[9,10]

In a recent study, we identified IOP changes during four standard yoga poses in glaucoma patients and healthy control subjects. Inverted positions increase IOP significantly; however common yoga positions have been incompletely investigated. Yoga practitioners need to know the result of common yoga positions and IOP. The four poses tested using the Reichert Model 30 Pneumatonometer were Adho Mukha Svanasana, Uttanasana, Halasana, and Viparita Kirani. (Figure 1) We measured the IOP prior to the pose in a seated position, immediately at the start of the pose, 2 minutes into the pose, immediately after assuming a seated position, and 10 minutes later in a seated position for a final IOP.

The study included 10 subjects (9 women; mean age: 62.3 ± 15.6 years) with primary open-angle glaucoma and 10 healthy individuals (8 women; mean age: 36.3 ± 12.8 years). Within the glaucoma group and within the control group, IOP increased significantly for all 4 yoga positions (repeated-measures ANOVA; all $P<0.01$) (Table 1).

Aside from the Halasana position, which reached borderline significance (P=0.08), there was no significant difference between glaucomatous and healthy eyes regarding the IOP response to position changes. The Adho Mukha Svanasana position showed the highest IOP increase: a 66.3% increase for glaucoma subjects and a 73.7% increase for control subjects during this pose. The Uttanasana position showed a 56.5% increase for glaucoma subjects and a 44.9% increase for control subjects. The Halasana position showed a 30.8% increase for glaucoma subjects and a 23.1% increase for control subjects. The Viparita Kirani position showed a 19.95% increase for glaucoma subjects and a 20.6% increase for control subjects.

Previous studies have tested only the headstand position, as shown; other positions also increase IOP. All four positions showed a significant increase in IOP in all subjects. Yoga practitioners

	Adho Mukha Svanasana		Uttanasana		Halasana		Viparita Karani	
	Glaucoma	Control	Glaucoma	Control	Glaucoma	Control	Glaucoma	Control
Baseline	16.9±3.2	16.6±2.8	17.1±3.9	17.9±2.5	18.1±2.8	17.8±2.7	17.4±4	17.2±2.8
Immediate	27.3±4.3	28.1±4.2	26.8±3.4	25.3±3.8	23.5±2.4	21.5±2.7	20.9±3.6	20.7±2.4
2 min.	28.1±3.8	28.8±3.9	26.4±3.1	26.1±3.6	23.7±3.5	21.9±3.4	20.4±3.7	20.1±2.6
Seated	17.6±3.7	17.9±2.6	17.9±4.6	18.1±3.1	18.4±3.1	16.8±2	17.5±3.3	16.9±3.2
10 min.	17.3±3.8	17.9±2.5	17.3±3.5	18.3±3	18±3.7	16.5±2	17.1±3.4	16.6±2.2

Table 1. Mean IOP (mmHg) during each position.

should be aware of the significant increase in IOP during these common positions, especially glaucoma subjects with severe disease. Yoga instructors should also be aware of practitioners who suffer from glaucoma and are performing yoga with them, modified positions perhaps should be suggested and used.

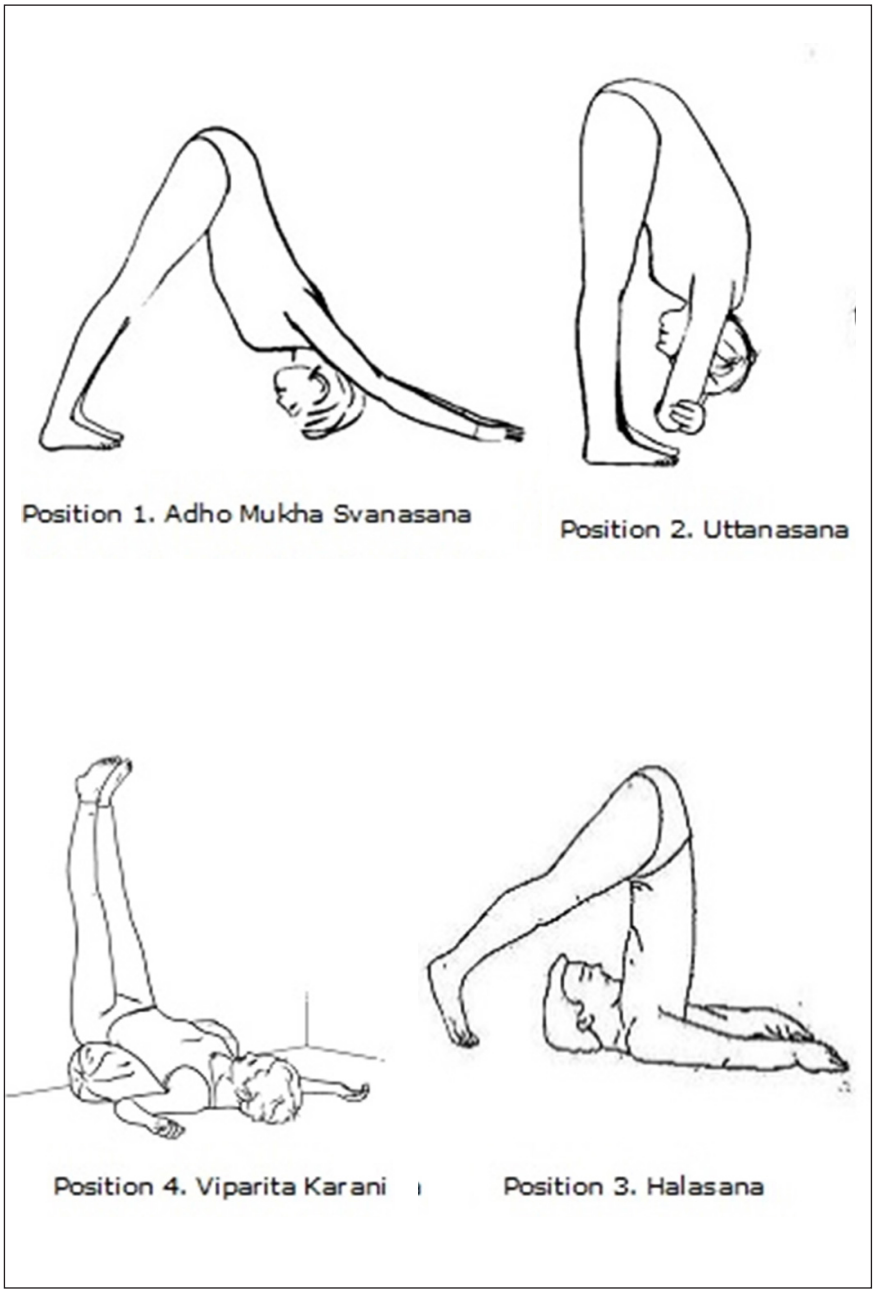

Figure 1. *Four Yoga Positions Tested.*

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