Table 1: Reviewed articles for tissue interface pressure

Reference	Country	Article Type & Subjects	Observations Measurements	Key Findings	Weaknesses
Jacobsen et al., 2008[5]	USA	**Literature review**	Reduction in occipital pressure ulcers	Improved nursing education and a variety of collars caused an reduction in occipital ulcer incidence	Only looked at their own trauma centre
Liew et al., 1994[13]	Australia	**Case review**: 2 patients	Pressure ulcer development	Ulceration is a complication of hard collar use	Only looked at 2 patients
Murphy et al., 1997[14]	USA	**Case review**: 1 patient	Pressure ulcer development	Occipital pressure ulcers after collar use are common; improved wound care/more suitable collars advised	Only one patient reviewed
Walker, 2012[4]	UK	**Retrospective analysis**: 90 patients	Pressure ulcer development	Cervically immobilised patients have an increased risk of developing pressure ulcers	Looked at all types of immobilisation not just semi-rigid collars
Powers, 1997[20]	USA	**Retrospective analysis**	Pressure ulcer development	Improved education, more suitable collars plus early collar removal protocol resulted in a ulcer reduction	Only looked at their own trauma centre
Blaylock, 1996[19]	USA	**Retrospective analysis** and study: 20 patients	Pressure ulcer development	Improved education on skin condition/wound care and collar fitting, plus a new collar design resulted in no ulcers in the subjects.	Possibility that the team were conscious regarding ulcer development.. Small sample size and only one trauma centre included
Molano et al., 2004[15]	Spain	**Retrospective study**: 92 patients	Pressure ulcer development	23.9% had ulcers; with occipital ulcers being more problematic to treat	Only looked at their own unit
Chendrasekhar et al., 1998[21]	USA	**Retrospective study**: 52 patients	Pressure ulcer development	Ulceration is related to duration of collar wear; early collar removal advocated	Only 34 patients actually included due to mortality and only 8 had their collar removed earlier than normal
Beavis, 1989[17]	UK	**Study**:10 volunteers, 4 collars	Tissue Interface Pressure at chin and occiput (25-172mmHg)	Passive and active results showed wide variance, but Beavis felt that the pressure was a positive feature, being an incentive not to move	No consideration for the impact of high interface pressure
Black et al., 1998[22]	USA	**Study**: 20 volunteers, 2 collars	Tissue Interface Pressure at occiput (39-83mmHg) plus skin temperature and humidity	No difference between the interface pressures of the collars was found; felt skin humidity was an important factor in ulcer development	Collars were worn for up to 30 minutes possibly impacting on pressure readings due to foam compression within the collar
Ferguson et al, 1993[10]	UK	**Study**: 5 patients, 6 collars	Tissue Interface Pressure around neck area (1.2-11.8mmHg)	Pressures recorded depended on the tightness of the collar	Sensor positions were possibly not indicative of true pressure points; tensions applied were subjective
Fisher, 1978[16]	USA	**Study**: 8 patients, 1 collar	Tissue Interface Pressure at chin an d occiput (25-105mmHg)	Passive interface pressures varied with collar tightness:	Used the same person to apply the collar; 'tightness' was subjective
Plaisier et al., 1994[18]	USA	**Study**: 20 volunteers, 4 collars	Tissue Interface Pressure at chin, occiput and mandible (27-57mmHg); plus comfort	Philadelphia/Stifneck collars exceed capillary closing pressure in some positions, yet Newport/Miami J did not; comfort ratings tallied with this	Skin humidity temperature data would have confirmed their 'skin friendly' endorsement of the Newport and Miami J collar
Tescher et al., 2007[23]	USA	**Study**: 48 patients, 4 collars	Tissue Interface Pressure at occiput and mandible	Miami J/ Miami J with Occian back had lower pressures recorded both seated and supine; however all maximal pressures recorded exceeded capillary closing pressure	Admit that interface pressure is an important consideration in ulcer development but admit other factors may play an important part