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Comparison of Injuries Sustained on Grass and Artificial Turf by USL1 Men's Soccer Team. Part 1: Match Related Injuries

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References:

Introduction

- Artificial turf fields have gained tremendous popularity in America due to their durability, minimal maintenance, and ability to withstand heavy use.
- Early generation Artificial turf fields were associated with higher rates of injuries.
- Artificial turf fields have seen significant advancement in technology and manufacturing leading to a much different product from its first introduction[1].
- Athlete health and safety as it pertains to playing surface is a reoccurring topic for debate.

Purpose

To analyze and compare the incidence, location, and type of injuries sustained on Artificial Turf (AT) and Natural Grass (NG) playing surfaces for a United Soccer League, League 1 (USL1) Men's Soccer Team.

Methods

- This is a retrospective cohort study using injury data from a USL1 Men's Soccer Team over the course of three USL1 seasons (2020-2022).
- The team's Certified Athletic Trainer meticulously documented all match related injuries requiring evaluation over the three-year period. Information included anatomic location and type of injured incurred as well as the geographic location and playing surface in which the injury took place.
- Injuries categorized by whether they occurred on NG (unexposed group) versus AT (exposed group). Data further subdivided into anatomic location and type of injury sustained utilizing the same categories as Fuller *et al*[2,3].
- Player match exposure time calculated by reviewing length of matches including extra time.
- Incidence rates were reported as number of injuries per 1000 player match hours with 95% confidence intervals. Incident rates for the exposed and unexposed groups were compared using analyses as detailed in Kirkwood and Sterne[4].
- Differences were determined to be significant if the 95% CI of the incidence ratio (equivalent to relative risk) did not include the value of 1.0 and the p value of the two-sided z test for the comparison of rates was < 0.05.

Results

- Three-year cumulative data for match exposure hours:
  - 427.87 hours on AT
  - 1085.23 hours on NG
- Incident rates for total match related injuries on AT and NG were an identical 161.26.
- Lower limb was the most frequently injured location on both AT and NG with no significant difference in injury incident rates (Table 1).
- Muscle/Tendon was the most common type of injury on AT and second most common on NG with no significant different in injury incident rates (Table 2).
- Contusion was the most common type of injury on NG and second most common on AT with no significant different in injury incident rates (Table 2).
- Laceration/skin lesion and central/peripheral nervous system injuries were higher on AT compared to NG; however, it was not statistically significant (Table 2).

Table 1. Comparison of injury rates on artificial turf and natural grass categorized by location of injury.

	Exposed Group (Artifical Turf)		Unexposed Group (Natural Grass)		Comparison - Artificial Turf Vs. Natural Grass			
Location of Injury	**# injuries**	**Incident rate per 1000 person-hours (95% CI)**	**# injuries**	**Incident rate per 1000 person-hours (95% CI)**	**Incident Rate Ratio**	**Lower 95% CI (rate ratio)**	**Upper 95% CI (rate ratio)**	**p**
Head/Neck	11	25.71 (14.24 to 46.42)	21	19.35 (12.62 to 29.68)	1.33	0.64	2.76	0.445
Upper Limbs	2	4.67 (1.17 to 18.69)	13	11.98 (6.96 to 20.63)	0.39	0.09	1.73	0.215
Trunk	8	18.70 (9.35 to 37.39)	12	11.06 (6.28 to 19.47)	1.69	0.69	4.14	0.250
Lower Limbs	48	112.18 (84.54 to 148.86)	129	118.87 (100.03 to 141.26)	0.94	0.68	1.31	0.732
Hip/Groin	5	11.69 (4.86 to 28.08)	21	19.35 (12.62 to 29.68)	0.60	0.23	1.60	0.311
Thigh	12	28.05 (15.93 to 49.38)	35	32.25 (23.16 to 44.92)	0.87	0.45	1.68	0.676
Knee	5	11.69 (4.86 to 28.08)	10	9.21 (4.96 to 17.13)	1.27	0.43	3.71	0.664
Lower Leg	14	32.72 (19.38 to 55.25)	31	28.57 (20.09 to 40.62)	1.15	0.61	2.15	0.673
Ankle	10	23.37 (12.58 to 43.44)	23	21.19 (14.08 to 31.89)	1.10	0.52	2.32	0.796
Foot	2	4.67 (1.17 to 18.69)	9	8.29 (4.32 to 15.94)	0.56	0.12	2.61	0.463
Total	69	161.26 (127.37 to 204.18)	175	161.26 (139.05 to 187.01)	1.00	0.14	1.32	1.000

Table 2. Comparison of injury rates on artificial turf and natural grass categorized by type of injury.

	Exposed Group (Artifical Turf)		Unexposed Group (Natural Grass)		Comparison - Artificial Turf Vs. Natural Grass			
Type of Injury	**# injuries**	**Incident rate per 1000 person-hours (95% CI)**	**# injuries**	**Incident rate per 1000 person-hours (95% CI)**	**Incident Rate Ratio**	**Lower 95% CI (rate ratio)**	**Upper 95% CI (rate ratio)**	**p**
Fracture/Bone stress	1	2.34 (0.33 to 16.59)	3	2.76 (0.89 to 8.57)	0.85	0.09	8.13	0.884
Joint (non bone)ligament/cartilage	8	18.70 (9.35 to 37.39)	24	22.12 (14.82 to 32.99)	0.85	0.38	1.88	0.681
Muscle/Tendon	29	67.78 (47.10 to 97.53)	62	57.13 (44.54 to 73.28)	1.19	0.76	1.84	0.447
Contusion	19	44.41 (28.32 to 69.62)	66	60.82 (47.78 to 77.41)	0.73	0.44	1.22	0.227
Laceration/Skin Lesion	4	9.35 (3.51 to 24.91)	5	4.61 (1.92 to 11.07)	2.03	0.54	7.56	0.292
Central/Peripheral Nervouse system	8	18.70 (9.35 to 37.39)	12	11.06 (6.28 to 19.47)	1.69	0.69	4.14	0.250
Other	-	-	3	2.76 (0.89 to 8.57)	-	-	-	-
Total	69	161.26 (127.37 to 204.18)	175	161.26 (139.05 to 187.01)	1.00	0.14	1.32	1.000

Conclusions

- Our study found no statistically significant differences in match related injuries among AT and NG for a Men's USL1 Soccer Team over three seasons.
- Additionally, no statistically significant differences were seen when stratifying the data by location and type of injury.
- This study suggests AT may be a safe and effective alternative to NG.
- Our research agrees with prior studies evaluating the risk of injury on AT and NG in various levels of soccer competition best summed up by a meta-analysis performed by *Williams et al*[5].

Limitations

- Although our findings could be extrapolated across all sports, this study specifically looks at men's professional soccer injuries.
- Larger data sets may elucidate statistically significant differences among location or type of injuries sustained.
- Study does not address injury severity.
- All artificial turf fields were 3rd generation fields, however, did not extrapolate brand or type of turf field.