A study of short scrotum, castrated and entire ram lambs

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ABSTRACT

Growth rates, carcass composition and management problems of "short scrotum" rams (made by elevating the testes to a position against the abdominal wall using rubber rings), wethers and entire male lambs were compared on a hill country property in northern Hawkes Bay. Of 3 groups of 65 Perendale lambs selected randomly at docking at about 4 weeks of age, 1 group was left entire, 1 was made short scrotum and the other was castrated. The lambs were weaned at about 10 weeks of age, separated from the main flock at about 14 weeks of age and thereafter kept as 1 flock until slaughter at 9 months of age. They were weighed every 6 weeks from 14 weeks of age. After the removal of 6 lambs from each group for detailed investigation at Massey University, the top 50 lambs from each group were slaughtered and their carcass characteristics recorded.

Short scrotum rams showed management advantages over normal ram lambs. They were easier to handle, and avoided the works hygiene problem of dirty genitalia. Short scrotum rams had an overall live-weight advantage of 3kg over wether lambs. This was found not to be due to fat deposition, as short scrotum rams showed a significantly lower GR of 3.3mm, compared with normal rams (4.6mm) and wethers (6.2mm), as predicted by regression for lambs of 32kg live weight. There was no significant difference in carcass weight or dressing percentage between lambs of this live weight, although more normal rams and short scrotum rams fell into heavier grades than did the wether lambs.

In detailed investigations on 6 lambs from each group, no differences were found in muscle:bone ratio or fat distribution between the groups. Short scrotum rams had very low fertility; 50 of 56 had no epididymal sperm reserves and 6 had extremely low sperm production. Most sperm from short scrotum rams were abnormal.

Short scrotum rams had significantly lighter testes and epididymides than normal rams. Short scrotum rams had plasma LH levels intermediate to normal rams and wethers. Differences between entire and short scrotum rams in testosterone levels varied inconsistently.

Keywords Lambs; rams; castration; short scrotum; cryptorchids; carcass composition; male reproduction

INTRODUCTION

Lambs can be rendered "short scrotum" by retaining the testes against the abdominal wall using rubber rings (Hudson *et al.*, 1968). In this way the normally pendulous scrotum of the ram is shortened.

A short scrotum ram is anatomically not a cryptorchid. True cryptorchids with testes located intraabdominally are known to be effectively sterilised (Kuruwita, 1981). Short scrotum rams have undergone scrotal ablation only; unless operated on soon after birth, their testes are usually external and subcutaneous in position. Thus the term "induced cryptorchid" is usually not anatomically correct.

Short scrotum rams are credited with advantages over both wethers and entire rams in possessing the growth rate benefits of entire males (Egan and Russell, 1981) without the associated husbandry problems that fertility creates and in being as lean as entire rams (Hudson *et al.*, 1968; Wilson *et al.*, 1970).

The technique is claimed to have a dramatic effect on fertility, with up to 70% of such lambs rendered totally sterile (Thwaites *et al.*, 1982). In those rams with some retention of spermatogenic function, 95% of such sperm were morphologically abnormal (Tierney and Hallford, 1985).

Little information is available on the performance of short scrotum rams under New Zealand conditions, though much is assumed (Wilson, 1984). This trial examined the effect of the technique on lambs on New Zealand hill country by comparing their performance with entire rams and wethers.

MATERIALS AND METHODS

The trial was designed as a practical on-farm exercise, taking into account management practices on the trial farm, a hill country property in northern Hawkes Bay.

Of 3 groups of 65 Perendale ram lambs selected randomly at docking (6 October 1984) when they were 4 weeks old, 1 group was left entire, 1 was castrated and 1 was rendered short scrotum by the application of rubber rings. The lambs were weaned on 16 November and separated from the main flock on 19 December when they received their first drench after weaning. From that date, they were weighed at 6 week intervals and treated as a single flock that was shorn, dipped and drenched at the same time as the main flock and was stocked at a similar rate. Thus their management was representative of that applied on the property.

Before slaughter in May 1985, the position of the testes in all ram lambs was ascertained by palpation, with the lamb in a supine position.

After the final weighing and removal of 18 lambs selected for further investigation at Massey University, the livestock picker from the freezing works in Wairoa removed all lambs unsuitable for slaughter. This group comprised 9 short scrotum rams, 9 entire rams and 8

wethers. At the freezing works, all lambs (50 short scrotum rams, 51 entire rams and 51 wethers) were blood sampled during slaughtering. The gonads of the entire rams and short scrotum rams were collected and the carcass characteristics (measurements of GR, carcass weight and final grade) were recorded.

The 6 lambs/group for detailed investigation at Massey University were selected so that their live weights were spread evenly across a logarithmic range at final weighing. They were transported to Palmerston North and held in pens for 2 days before slaughter, while semen and endocrinological analyses were carried out. Lambs were blood sampled every 20 minutes for 3 hours to examine endocrinological profiles.

Plasma levels of luteinising hormone (LH) and testosterone from both the freezing works and Massey lambs were determined by radioimmunoassay (Niswender *et al.*, 1969; Wilson and Lapwood, 1979).

The carcass composition of the Massey lambs was examined using a total carcass dissection technique (Fourie, 1975; Tan, 1980). The fertility of the short scrotum and entire ram lambs was assessed, both directly by semen collection, and indirectly by assessment of epididymal spermatozoal reserves (Lino, 1972). Testes and epididymides were dissected and weighed.

Carcass data for the 'freezing works' and Massey lambs were analysed separately by a double logarithmic regression technique to predict carcass parameters at a particular live weight and carcass weight, for each treatment group, as in Table 1. The significance of differences in these predictions between treatment groups was assessed by the overlapping, or otherwise, of their 95% confidence limits.

RESULTS AND DISCUSSION

Location of Testes in Short Scrotum Lambs

Only 1 short scrotum lamb had an intraabdominal testis. Its other testis was external and subcutaneous in position. The other 64 short scrotum rams had both testes in this external position. All of the entire ram lambs had normally located testes. Truly cryptorchid lambs therefore appear to be rare by this technique when it is performed at 4 weeks of age. Other reports on "induced cryptorchidism" do not specify the location of the testes.

Live Weights

Live weights of the short scrotum and entire rams were similar (Fig. 1). Wethers showed significantly lower live weights at the same age than either entire or short scrotum rams.

The growth depression for all lambs in the middle of the measured period was presumed due to the unusually low rainfall and grass growth at this time.

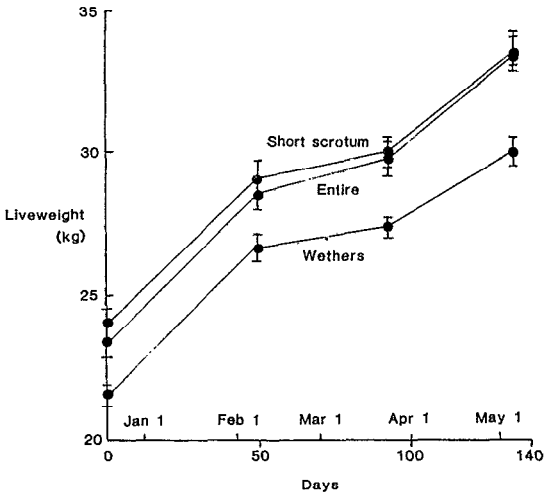

FIG. 1 Mean live weights (± SEM) of groups of 65 entire rams, short scrotum rams and wether lambs over the period from 19 December 1984 to 5 May 1985.

TABLE 1 Mean values (95% confidence limits) predicted from within-group double log regressions of carcass weight (kg) on live weight and of GR (mm) and carcass components (kg) on carcass weight. Predicted values are at 32kg live weight (carcass weight) and at 17 kg carcass weight (GR, carcass components).

	Short scrotum	Entire	Wethers
Carcass weight			
Freezing works	13.5 (13.1,13.9)	13.6 (12.7,14.4)	13.6 (12.9,14.4)
Massey	16.2 (15.3,17.1)	17.0 (15.9,18.3)	18.1 (13.2,24.8)
GR			
Freezing Works	3.3 (2.8, 3.9)	4.6 (3.9, 5.5)	6.2 (3.9, 9.9)
Massey	4.5 (3.4, 5.9)	7.4 (5.3,10.3)	7.5 (4.6,13.7)
Carcass components			
Muscle	9.4 (8.8,10.0)	8.8 (8.4, 9.4)	9.0 (8.2,10.0)
Bone	2.8 (2.6, 3.0)	2.6 (2.4, 2.8)	2.6 (2.0, 3.4)
Fat	2.4 (2.2, 2.8)	3.0 (2.2, 4.4)	3.0 (2.0, 4.6)

Carcass Characteristics

Within either the 'freezing works' or Massey groups, carcass weights, compared at the same live weight, were similar for entire and short scrotum rams, with a trend towards a higher value for wethers (Table 1). This was apparently due to a higher dressing percentage for wethers (Veseley, 1973). Presumably because of the difference in pre-slaughter treatment, each of the 3 groups of lambs had higher carcass weights at the same live weight in the Massey group. Short scrotum rams had a significantly lower mean GR measurement than both entire rams and wethers. Since GR is considered to be a satisfactory indication of carcass fatness (Kirton and Johnson, 1979), the short scrotum rams were leaner than the entire rams.

Carcass Composition

A total dissection technique and the use of double logarithmic regressions showed no significant difference between sexes in either muscle, bone or fat components (Table 1). The short scrotum ram group had a lower carcass fat component, supporting the GR result. No significant difference in fatness was observed between rams and wethers. This is contrary to most observations (Robertson, 1966; Purchas, 1978; Crouse *et al.*, 1981). The result could be due to the use of Perendales, an inherently lean sheep breed. There were no overfat wethers killed off this farm in the 1984-85 season. Also, any differences may be obscured by the large between-animal variations in a pasture fed species such as sheep. A trial using a fat lamb breed under conditions of high feed intake might well reveal larger differences in fatness between entire and castrate males.

Genital Organ Weights

In both the 'freezing works' and Massey data, short scrotum rams possessed significantly lighter testes and epididymides than entire rams (Table 2). In comparison with results for true cryptorchids of a similar age (6.1g testis weight, 2.3g epididymis weight (*Kuruwita, 1981*)), mean testicular and epididymal weights of short scrotum rams were significantly higher (42.3g and 7.1g). Therefore, genital development was not inhibited as dramatically as in true cryptorchids.

TABLE 2 Mean testis and epididymal weights (g) and semen characteristics of entire and short scrotum rams.

	Short scrotum	Entire	Significance
Testis weight			
Freezing Works	42.3	136.0	***
Massey	45.1	115.6	***
Epididymal weight			
Freezing works	7.1	22.5	***
Massey	8.0	20.2	***
Semen analysis (Massey) Motility (range 0-5)	0	4	-a
% normal sperm	20	91	-a
Sperm / ml	2.4×10^5	4.1×10^8	-a

a Not tested

Fertility

Direct analysis of semen showed that sperm produced by short scrotum rams was of very low motility and that there was a high proportion of morphologically abnormal sperm, compared with entire rams (Table 2).

Epididymal spermatozoal reserves of such rams were also extremely low, with 90% of short scrotum rams at the freezing works being infertile. Overall, 50 of 56 short scrotum rams were totally sterile (Table 3).

Thus in all cases, fertility was impaired if not eliminated. In cases where some spermatogenic function was maintained, the high proportion of abnormal sperm would make the chances of fertility extremely low (Emmens and Robinson, 1962).

TABLE 3 Epididymal spermatozoal reserves of short scrotum and entire rams.

	n	Mean Sperm/ml	Range
Freezing works			
Short scrotum	45	0	— 0
	5	2.0×10^4	1.5×10^3 — 3.2×10^4
Entire	51	4.1×10^8	1.0×10^8 — 13 $\times 10^8$
Massey			
Short scrotum	6	2.1×10^3	0 — 1.3×10^4
Entire	6	3.9×10^8	2.7×10^8 — 6.6×10^8

Endocrinology

Plasma LH and testosterone levels of entire rams were compared with those of short scrotum rams, and levels of animals with testes (entire and short scrotum rams) were compared with those of wethers (Table 4). Short scrotum rams had elevated LH levels, shown both by the serial sampling regime at Massey University and the single sampling at the freezing works. Wethers had elevated LH levels, compared with animals with testes. The wethers examined had inappreciable levels of testosterone. In the Massey trials, entire rams had higher testosterone levels than short scrotum rams. At the freezing works, the effect was the opposite of this, although the difference was not significant.

CONCLUSIONS

The growth rate of short scrotum rams was as good as entire rams. Short scrotum rams were leaner than entire rams. This difference is likely to be associated with the altered hormonal status of short scrotum rams, but a direct association with LH or testosterone

TABLE 4 Mean (standard error of mean) plasma concentrations (ng/ml) of LH and testosterone from serial sampling (Massey) or single samples (Freezing works).

	Short scrotum (S)	Entire (E)	Wethers (W)	Significance of E v S	(E+S) v W
Massey					
LH	1.74 (0.28)	0.35 (0.11)	10.96 (1.89)	**	***
Testosterone	1.24 (0.46)	2.07 (0.55)	0	*	a
Freezing works					
LH	2.22 (0.34)	0.19 (0.02)	12.49 (0.84)	***	***
Testosterone	3.04 (1.05)	1.66 (0.32)	0	ns	a

a Not tested
ns $P>0.05$

level differences cannot be assumed from these findings. Other unmeasured hormones could be equally or more relevant. This fat reduction is especially advantageous while the meat schedule favours heavier, leaner lambs. Short scrotum rams also process better than entire rams; they skin easier and undergo less contamination because of their cleaner genitalia (Dobbie *et al.*, 1985).

These advantages are reflected in a price advantage for the lambs of this trial of nearly $3 per lamb (1984-85 schedule) for short scrotum rams, compared with wethers. There was no difference in price between short scrotum and entire rams.

This monetary benefit, in addition to the higher growth rate and relative infertility of short scrotum rams, makes them an option worth considering by New Zealand hill country farmers.

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