

# Turn-overs in Contact Situations in Rugby Football: The Effectiveness as Attacking Point and the Mechanism of Occurrence

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**The purpose of this study was to examine the effectiveness as attacking point and the occurrence mechanism of turn-over in contact situations in rugby football. Fifteen top-ranking, high level international matches were analyzed. After analysis one result found that performance in attack without kicking from turn-over in contact situations was significantly higher than from two either scrums or line-outs, in terms of scoring and advances in the field area. Performance in attack with kicking from the turn-over situation was significantly higher than that from line-outs in terms of the continuity in possession. These findings suggest that turn-over in contact situations is advantageous as attacking point. Results also found that turn-over in contact situations could be classified into five categories; tackle turn-over, tap turn-over, "jackal" turn-over, ruck turn-over, and maul turn-over based on an analysis of play which produces turn-overs. Furthermore, different sequences of occurrence were identified after analyzing the turn-over process in detail and were sub-classified in each turn-over category. Based on the findings of this research it is suggested that further study into techniques and tactics of turn-over play should be undertaken.**

**Keywords:** rugby football, turn-over, contact situation, occurrence mechanism, attacking point

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## 1. Introduction

In rugby, a 'turn-over' is when the ball possession is transferred to the defending team from the attacking team. Turn-overs are classified into two categories; one occurring when the attack abandons the ball possession due to their own error such as a handling mistake, and the other occurring when the defense captures the possession due to their efforts. The latter includes turn-overs occurring in set-play, intercepting, kick-charging, pushing out of touch, and situations when a ball-carrier contacts with a tackler. How often these turn-overs are occurred can be seen as the utmost aim for the defense.

The plays leading to turn-overs in contact situations, in particular, seem to become more and more vital because continuity of attacking has been regarded as an important factor in recent rugby games (Murakami et al., 2001; Tsubakihara and Watanabe, 2003) and the frequency of the contact

situations occurred has been increasing. For instance, according to the analysis of all the matches of the past two World Cups, in 2003 the total number of rucks and mauls that would be contest phases after a ball carrier contacts with a tackler increased by 36 per match reaching 136 than that of 1999 (IRB, 2003). In addition, an analysis of the matches on and after quarter finals shows that the number in 2003 increased by 29 in average reaching to 165 than that of 1999 (Soeda et al., 2005). Although these two results presumably have differences due in part to the judgments carried out on rucks and mauls, the contact situations still seem to occur 200 times per a match at present, including those which do not result in rucks or mauls. If one supposes half of those is defensive, the number of times the defense captures the ball possession out of approximately a hundred contact situations is presumably a major factor in determining the outcomes of the matches.

Another reason why the turn-overs in contact

situations are important is that attacks which originate from turn-overs are seemingly advantageous. In recent rugby games, especially, organization of the defense has developed, and it is becoming harder for the attack to break through the defense in ordinary attacks from set-plays (Murakami et al., 2001). In contrast, as the situation reverses itself and the attack has to defend in changing hands at the turn-over, they are not able to organize their defense properly, and that results in the opponent easily makes an effective move when attacking. However, the rationale demonstrating that the attack starting from the turn-over in the contact situation is highly effective has not been presented to game analytic research (Sasaki et al., 2000; Okamoto et al., 2001; Sasaki et al., 2005; Soeda et al., 2005), so this problem is one that is worth further research.

Focusing on the practical field, we need to consider a play which causes a turn-over (turn-over play, hereafter) as an essential exercise on the supposition that the turn-over in contact situations is a vital factor in the current rugby games. Although what the players should do or what skills they should acquire to practice turn-over plays in contact situations are fragmentarily presented to them (Ohmatsu, 2003; Marash, 2005; Niibori, 2005), it cannot be said that systematic explanation is offered to them such as ball retention skill in contact situations (Ohmatsu, 2003; NSWRU, 2004). Therefore, it seems that the coaches and players on the field search for their own way to attempt such exercise.

In order to clarify practice undertaken for turn-overs in the contact situation, it is necessary to realize the mechanism of turn-overs that occur in the contact situation. With regard to that, previous studies (Yasugahira et al., 1999; Sasaki et al., 2000; Okamoto et al., 2001) help, but details have not fully become clear yet. It is most likely that techniques and tactics of turn-over plays in contact situations will not be well extracted until the mechanism of turn-overs occurred in contact situations is clarified. Therefore, the mechanism of turn-overs in contact situations should become understandable.

Considering these circumstances, this study was conducted aiming at clarifying the following two research areas:

- 1) To demonstrate that turn-overs in contact situations are effective as attacking points in

rugby games.

- 2) To clarify the details of the mechanism of turn-overs occurring in contact situations.

## 2. Method

### 2.1. Samples

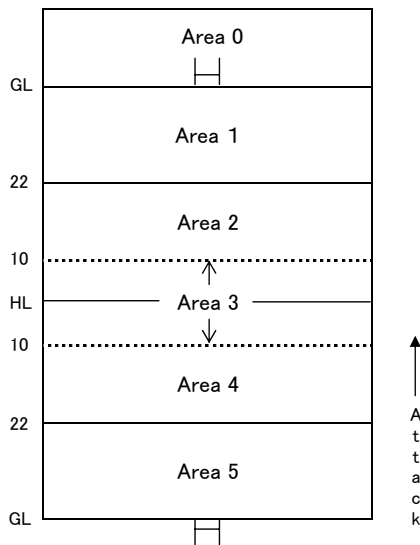
In this study, top level rugby games<sup>1)</sup> worldwide were selected as the subject of this study. The selection was based on the premise that it is necessary to analyze the most prominent rugby games and present a model for the benefit of rugby games at all levels as the mechanism of turn-overs occurring in contact situations has yet to be clarified. Accordingly, 15 matches<sup>1)</sup> in total were selected, consisting of 10 out of the Six Nations matches but excluding ones involving Italy, held among 6 major nations in the north hemisphere in the 2004-05 season and 5 out of all 6 matches of Tri Nations, among New Zealand, Australia and South Africa in the southern hemisphere. One Tri Nations match conducted in heavy rain was excluded. According to world rankings between April 2004 and March 2005 conducted by the IRB, 7 out of the 8 nations selected in this study were ranked the eight best throughout the year and the remained one was ranked ninth or tenth, so all the 15 matches selected in this study are considered as top level rugby games.

### 2.2. Identifying turn-over plays in contact situations

The 15 matches selected were observed on videotapes and all the plays causing turn-overs in contact situations in which ball carriers contested against defense players for the ball were picked out. The contact situations in this definition not only included the situations in which the defense tackles but also those in which the defense intentionally cause contact plays against the ball carrier such as holding an opponent's body and knocking the ball or his arm. Additionally, the situations in which the defense player takes action against an opponent who fell on the ball is also considered as one of the contact situations in which the ball is contested between the ball carrier falling down on the ground and the defense player. Although a play where the

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<sup>1</sup> We use the term matches to indicate the abstract concept of rugby game appeared in sport events in reality.



**Figure 1** Division of rugby pitch

ball carrier is pushed out of touch and a play bringing touch down by tackling are both definitely turn-over plays caused by tackles, they are not considered turn-over plays in contact situations in the study because turn-over does not occur in contact.

### 2.3. Exploration of efficiency of turn-overs in contact situations as attacking points

#### 2.3.1. Analyzing method

In order to explore the efficiency of turn-overs in contact situations as attacking points, the performance achieved by attacks from turn-overs in contact situations was compared with the performance achieved by attacks from two major set-plays: the scrum and the line-out.

The outcomes of a sequence of the attack starting from an attacking point until play was stopped by a referee's whistle or until the turn-over was carried out by the opponent were considered as attacking performance. With regard to attacks with kicking, the occasion when the opponent catches the ball originating from kick was not considered as a turn-over, but when a ruck or maul is formed after the opponent begins a counter-attack using the kicked ball and the ball is retained was considered a turn-over. Yet, where attacks did not consequently continue due to fouls or mistakes even after the ball was captured at the attacking point were excluded from the analysis.

Attacking performance was evaluated from three

viewpoints. Firstly is points scored, and the outcome was recorded in the event that a series of an attack brought a try, a penalty goal (PG, hereafter), or a drop goal (DG, hereafter). Secondly the distance advanced by a series of attacks, with the playing area being divided into 6 areas as shown in **Figure 1**, and the number of areas advanced from the first attacking point to the area where the play finally stopped or the attack was terminated by the opponent's turn-over was recorded. A try was also considered as advancing to Area 0 of In-goal, and the number of areas advanced was recorded. The third viewpoint considered ball possession kept according to a series of attacks, and whether or not the possession continued or whether the possession was forfeited in the middle or at the next restart was recorded.

#### 2.3.2. Analyzed data processing method

Data from the 15 matches were gathered and processed. During data processing, all attacks were classified into two categories: attacks with and without kicking. When attacks ended due to only opponents' scrum push, or maul drive, however, the attacks were excluded from the analysis. With regard to the results of the analysis in terms of points scored and ball possession kept among the attacking performances recorded, the percentages of scoring points and keeping ball possession per area respectively shown in **Figure 1** between the attack starting from the turn-over in the contact situation and the one starting from scrum or line-out were used as data and the respective significance was measured using a chi square test. Additionally, after the field was divided into mainly 2 parts, the opponent's area which includes Area 1 and 2 and the area from the defense's area to the mid-field which includes Area 3, 4 and 5, the percentages of scoring points and continuing possession were gained and also measured using a chi square test for significance. With regard to the results of the analysis focusing on the number of areas advanced, among attacks starting from turn-overs in contact situations and from scrum or line-out the mean value was measured for significance through a t-test for a respective area of five of the field and two parts of the field mentioned earlier.

#### 2.3.3. Objectivity of the analyzed data

As the analysis mentioned above was conducted by one of the authors alone, it was needed to

examine the objectivity of the analyzed data. Therefore, the same three matches were separately analyzed by both the authors, and the intra-class correlation coefficients were to be calculated about the four categories of each attacking point, the number of the actual attacks, scoring points, the advanced areas, and the successions of possession.

#### **2.4. Analysis of occurrence mechanism of turn-overs in contact situations**

In order to clarify the mechanism of turn-overs occurring in contact situations, the analysis was conducted according to the following procedures. Firstly, video pictures of the turn-over plays at the contact situations identified were selected and edited for repeated viewing, and each process of the play was described in as much detail as possible. Secondly, through checking the description together with the pictures, the turn-overs in the contact situation were categorized according to the plays directly causing the turn-overs. Subsequently the detailed process of each categorized turn-over was analyzed and sorted, and several different sequences of turn-overs occurred were discovered and schematized. In addition, the frequency of turn-overs occurring in each sequence was also sought.

The above mentioned procedures were followed by two of the authors in collaboration along with their repeated discussion to reduce the possibility of unreliable data.

### **3. Results and Discussion**

#### **3.1. Identifying turn-over plays in contact situations**

Through observing the 15 matches videotaped, a total of 188 cases of turn-over plays in contact situations at an average of 12.5 cases per a match, were identified. This total was comprised of 89 cases of turn-over plays in which the ball was directly captured (5.9 cases per a match) and 99 cases (6.6 cases per a match) in which the ball was recaptured after the play stopped and restarted. When play continued according to advantage rules even after the opponent committed a foul at the same time when the ball was directly captured by the turn-over was included in the former, as direct turn-over plays, while occasions when play stopped after an

attack commencing from a turn-over which was not accepted by advantage rules were included in the latter as indirect turn-over plays.

Among turn-over plays in which the ball was recaptured from the restart, there were 44 cases leading to penalty kicks (2.9 cases per a match), and 55 cases leading to scrums of their own ball (3.7 cases per a match), and the percentage of the former was 16 % of the total number while that of the latter was 18%. This suggests that in penalty kicks and scrums nearly 20 % all the attacks were obtained by turn-overs in contact situations.

#### **3.2. Efficacy of turn-overs in contact situations as attacking points**

The results of the analysis which was conducted to examine whether turn-overs in contact situations are effectively working as attacking points are followed by some implications. Among the results sought at each divided area, only the results showing significance are presented.

The intra-class correlation coefficients calculated in order to clarify the objectivity of the results were ranging from .84 to 1 with the average of .94. This suggests that the objectivity in the results of the analysis is high within the acceptable level (Kirkendall et al., 1987).

**Table 1** shows the results where the percentage of scoring points in a sequence of an attack after a direct turn-over occurred in a contact situation was compared with that of attacks after a scrum or line-out. Although tries, PG, and DG, were respectively analyzed, the total percentage of points scored of all the three added was displayed because each number of times was not in sufficient. It is found from this table that those starting from turn-overs in contact situations among attacks without kicks in Area 1 and 2 (See **Figure 1**), the opponent's area, show a higher percentage of scoring points, and that those have a significant difference compared with attacks starting from a line-out.

**Table 2** shows the results where the mean of areas advanced due to a sequence of an attack starting from a direct turn-over at contact situation was compared with that from scrum or line-out. It is found from this table that those attacks starting from turn-overs in contact situations among attacks without kicks in both parts of the field show a tendency of a higher number of average areas advanced, and that

**Table 1** A Comparison of percentage of scoring between attack from a turn-over in contact situations and attack from two major attacking points

	Turn-over in Contact Situation (TO)		Attacking Point		Significant Difference
			Scrum (S)	Line-out (LO)	
<Attack without kicking>					
Area 1/2	40%	(4/10)	21% (17/82)	12% (12/103)	*TO>LO
Area 3/4/5	11%	(3/27)	8% (4/48)	9% (8/91)	n.s.
<Attack with kicking>					
Area 1/2	0%	(0/3)	28% (5/18)	16% (5/31)	n.s.
Area 3/4/5	0%	(0/44)	6% (5/90)	0% (0/141)	n.s.

Note 1. Area number: See **Figure 1**.

2. ( ): Number of attacks leading to score / Total number of attacks

3. \*:  $P < .05$ , n.s.: non significant

**Table 2** A comparison of number of advanced areas between attack from turn-overs in contact situations and attack from two major attacking points

	Turn-over in Contact Situation (TO)		Attacking Point		Significant Difference
			Scrum (S)	Line-out (LO)	
<Attack without kicking>					
Area 1/2	0.70±0.67	(10)	0.33±0.63 (82)	0.33±0.69 (103)	*TO>S
Area 3/4/5	0.93±1.04	(27)	0.48±0.90 (48)	0.63±0.98 (91)	*TO>S
Area 1	0.67±0.58	(3)	0.08±0.54 (38)	0.07±0.65 (29)	*TO>S
Area 4	1.40±1.43	(10)	0.44±1.09 (16)	0.50±0.52 (16)	*TO>S, LO
<Attack with kicking>					
Area 1/2	0.67±0.58	(3)	0.64±0.74 (14)	0.43±0.92 (28)	n.s.
Area 3/4/5	1.32±1.07	(44)	1.20±0.96 (90)	1.13±1.00 (141)	n.s.

Note 1. Area number: See **Figure 1**.

2. Value: Mean±SD, ( ): Total number of attacks

3. \*:  $P < .05$ , n.s.: non significant

those have a significant difference compared with attacks starting from scrum. Focusing on each area, especially in Area 4, the defense's area, attacks starting from turn-overs in contact situations have a significant difference found compared with those not only from scrum but also from line-out. It was also found that the areas advanced due to attacks starting from turn-overs in contact situations were approximately three times more than those due to attacks from scrum or line-out. In contrast, there is no significant difference found in attacks with kicks.

**Table 3** shows the results where the percentage of keeping the attacking possession without the

opponent's turn-overs after a sequence of an attack starting from a direct turn-over at a contact situation was compared with that of attacks from scrum or line-out. Although this table shows no significant difference in attacks without kicks, it is found in attacks with kicks that the percentage of continuing possession tends to be higher in attacks starting from turn-overs in contact situations in Area 3, 4, and 5, and that it has a significant difference compared with those from line-out.

The above results show that among attacks starting from turn-overs in contact situations those without kicks lead to a better performance in terms of points

**Table 3** A comparison of percentage of continuing possession between attack from turn-overs in contact situations and attack from two major attacking points

	Turn-over in Contact Situation (TO)		Attacking Point		Significant Difference
			Scrum (S)	Line-out (LO)	
<Attack without kicking>					
Area 1/2	57%	(4/7)	33% (24/73)	38% (35/93)	n.s.
Area 3/4/5	35%	(9/26)	40% (19/47)	36% (31/85)	n.s.
<Attack with kicking>					
Area 1/2	33%	(1/3)	31% (4/13)	23% (6/26)	n.s.
Area 3/4/5	34%	(15/44)	28% (25/88)	21% (29/141)	*TO>LO

Note 1. Area number: See **Figure 1**.

2. ( ): Number of attacks continuing possession / Total number of attacks

3. \*:  $P < .05$ , n.s.: non significant

scored and areas advanced in comparison with those starting from scrum or line-out. Attacks with kicks, by contrast, are found to lead to a better performance in terms of the possession of a ball kept afterwards in comparison with those starting from line-out. Therefore, it can be considered that the above results demonstrate that turn-overs in contact situations have the advantage of working as attacking points. It can also be said that the results suggest the importance of further research on turn-overs in contact situations.

### 3.3. Mechanism of occurrence of turn-overs in contact situations

#### 3.3.1. Classification of turn-overs in contact situations

Analyzing the identified turn-over plays, it was found that turn-overs in contact situations can be classified into five categories according to direct plays causing turn-overs: a) tackle turn-overs causing direct turn-overs by tackling the opponent ball carrier; b) tap turn-overs causing turn-overs by knocking either a ball or the opponent ball carrier's wrist or arm; c) jackal<sup>2)</sup> turn-overs causing turn-overs by attempting to rob a ball the tackled opponent placed on the ground; d) ruck turn-overs causing turn-overs by rucks formed after contact with the opponent ball carrier; and e) maul turn-overs causing turn-overs by mauls formed after contacting with the

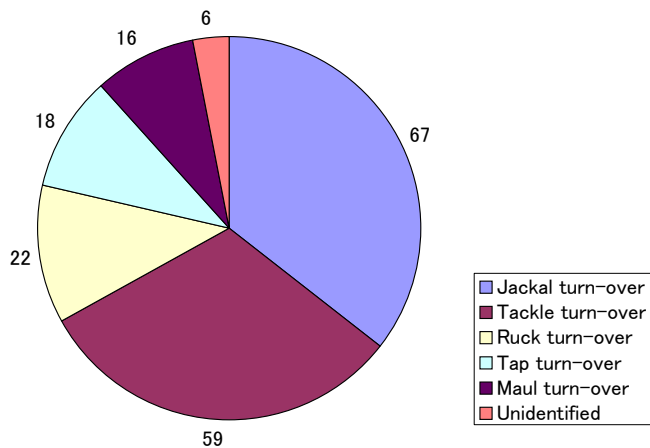
opponent ball carrier.

**Figure 2** shows 188 cases of turn-overs in contact situations identified in this study classified into the five categories. 'Unidentified' in the figure indicates cases of poor or unclear images. The figure illustrates that jackal turn-overs were the most frequent of the five categories followed by tackle turn-overs, and they accounted for about 30 percent of the whole. Like ruck turn-overs and maul turn-overs, turn-overs caused by mass play accounted for less than 20 percent even after both were added together. The results of this classification show the same tendency reported by Yasugahira et al., (1999) that the fewer players gather in contact situations the more turn-overs occur in the international matches.

#### 3.3.2. Mechanism of occurrence of Tackle turn-overs

Analyzing and sorting 59 cases of processes of tackle turn-overs identified the sequential occurrence of tackle turn-overs was likely to be schematized as appearing in **Figure 3**. This figure illustrates that direct plays causing tackle turn-overs include plays in which a single defender tackles a ball carrier of the attack (Single tackle, hereafter), plays in which two defenders tackle a ball carrier simultaneously (Double tackle, hereafter) and plays in which one defender tackles a ball carrier followed by another defender's immediate tackle (1st & assist tackle,

2 The term 'jackal' stands for a play in which a defender attempts to seize the ball the opponent player fallen on the ground placed. This is an expression that has gained use in Australia (Hayashi, 2002), and recently the term has become widely used in Japan (Ohmatsu, 2003; Marash, 2005; Niibori, 2005) although its use is not universal. It is used because of the necessity of such a short word.



**Figure 2** Identified turn-overs in contact situations classified according to frequency

hereafter). Twenty eight turn-overs caused by single tackles were identified, 12 by double tackles, and 19 by 1st & assist tackles. This shows that the number of turn-overs caused by collaborative tackles combining double and 1st & assist tackles was almost the same as the number of turn-overs caused by single tackles. It was also found that there are three styles for capturing the ball: directly capturing a ball; capturing a loose ball dropped out of the attack ball carrier's hands; capturing a ball at the time of a restart due to a foul the attacker makes such as knock-on. Each number of the cases identified was 7, 26, and 26 in the above order. Accordingly, most of tackle turn-overs seem to be caused by a ball lost by a ball carrier of the attacking team.

Exploring tackles causing tackle turn-overs further, it was found that there are certain factors common to the height and timing. The turn-overs occurring by directly seizing the ball consisted of 1 case of single tackle, 1 of double tackle, and 5 of 1st & assist tackle. All of them were confirmed as tackles to the upper part of a ball carrier's body above the band of a player's shorts, which were regarded as tackles to the upper body in this study. The turn-overs occurring by forcing the opponent's ball carrier to lose the ball consisted of 27 cases of single tackle, 11 of double tackle, and 14 of 1st & assist tackle, of which 2 cases were done by 2 assist tacklers. Twenty four cases out of 27 single tackles were confirmed as tackles to the upper body, while all double and 1st & assist tackles included tackles to the upper body in collaborative tackles and it was confirmed that turn-overs occurred by letting the ball lost after all

two or three participating players tackled the upper body in 8 out of 11 double tackles as well as 12 out of 14 1st & assist tackles. Focusing timing of tackles, among tackles occurred the moment the opponent caught a ball after it is passed and kicked (13 cases of 27) as well as those occurred when he attempted to pass a ball (6 cases), it was confirmed that turn-overs frequently occurred by forcing the opponent lose the ball.

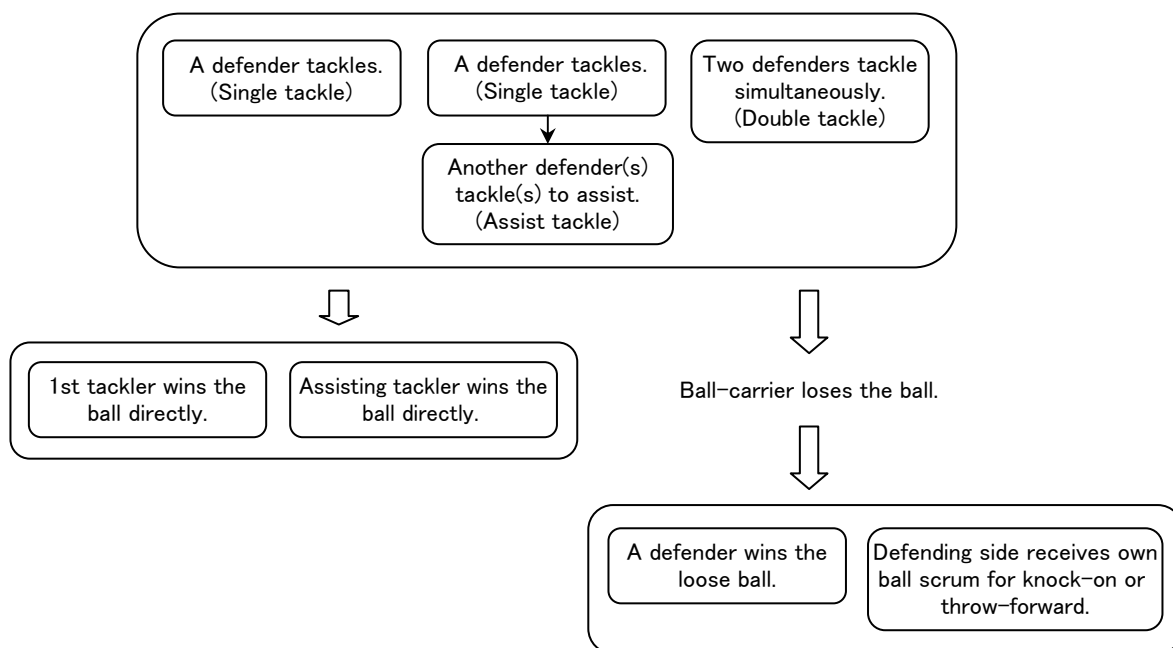
### 3.3.3. Mechanism of occurrence of Tap turn-overs

Analyzing and sorting the process of turn-overs intended for 18 cases of tap turn-over plays identified, the sequential occurrence of tap turn-overs was schematized as appearing in **Figure 4**. This Figure illustrates that tap turn-overs occur by seizing hold of the loose ball produced by knocking the ball out of the opponent's hands, by hitting the ball carrier's wrist or arm, or by seizing the possession when restarting due to an opponent's foul such as a knock-on (1 case of the foul of knock-on offside found other than knock-on). Thirteen cases of plays knocking the ball and 5 of plays hitting the wrist or arm were identified, and the number of turn-overs by capturing the loose ball and ones by seizing the possession in next restart plays was nearly half.

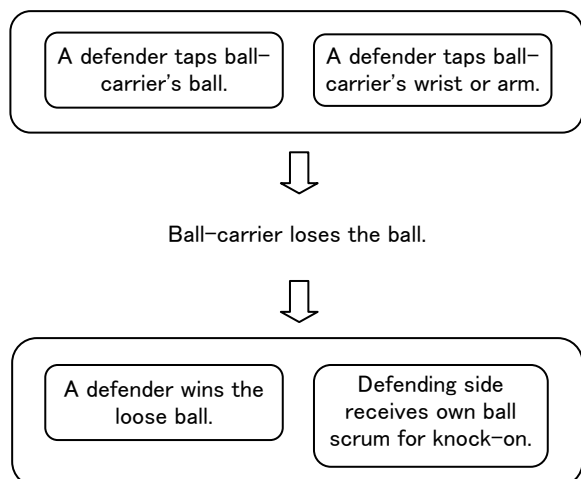
Exploring the circumstances in which the tap turn-overs occur, it was found that 7 out of the 18 cases occurred when a ball emerging from a ruck was to be passed by the scrum half (SH, hereafter) or players in the SH position. All the tap turn-overs caused by hitting the ball carrier's wrist or arm, in particular, occurred in the circumstances related to SH.

### 3.3.4. Mechanism of occurrence of Jackal turn-overs

Analyzing and sorting the process of turn-overs of 67 cases of jackal turn-over plays that were identified, the sequential occurrence of jackal turn-overs was schematized as appearing in **Figure 5**. The figure illustrates that jackal turn-overs occur by seizing the capture of possession after attempting to jackal the ball placed on the ground by a tackled ball carrier. The cases when the ball carrier falls on the ground occur not only by tackles from the defending team but also by the ball carrier's own falling (1 case identified) or falling the loose ball on the ground (6 cases). Additionally, there were four patterns identified of seizing the possession. Firstly, seizing



**Figure 3** Occurrence sequence of tackle turn-over



**Figure 4** Occurrence sequence of tap turn-over

the ball directly by the jackal player ; secondly by gaining a PK from a foul committed at jackal such as not releasing the ball; thirdly by getting the loose ball lost by the carrier; and lastly by gaining an attacking scrum after a knock-on where the carrier lost possession. The cases identified respectively are 20 for the first pattern, 37 for the second which comprised 33 not-releasing the ball and 4 going over the top of a ruck committed by the attacking player, 7 for the third, and 3 for the fourth. It can be seen that the majority of jackal turn-overs occur by seizing the ball from the ball carrier or by gaining a PK due

to not releasing the ball after jackaling.

After closer examination the jackal plays were classified into three categories: a) leading to turn-overs in which the tackler jackaled immediately after knocking the ball carrier; b) leading to turn-overs in which not the tackler but the arriving player jackaled; and c) leading to turnovers in which the tackler jackaled accompanied by another arriving player. 23 cases of the first category were identified, 38 for the second, and 6 for the third, illustrating that the jackals leading to turn-overs by the arriving player occurred the most frequently.

Jackal plays by tacklers further classified into two categories, one in which the tackler knocked the opponent with himself standing and jackaled, and the other in which the tackler jackaled immediately after standing up even though he fell on the ground along with the opponent. Fifteen cases were identified in total for the former, consisting of 2 of single tackles, 6 of double tackles, and 7 of 1st & assist tackles, mostly due to collaborative tackles. It was found that in double tackles one tackler was standing although the other one fell down when knocking the opponent ball carrier so that the standing tackler could jackal. In contrast, it was found that in 1st & assist tackles the standing tackler jackaled when either two tacklers were both standing when knocking the opponent ball carrier (2 cases) or one or two assist tacklers were standing (5 cases). Other jackal play when the fallen



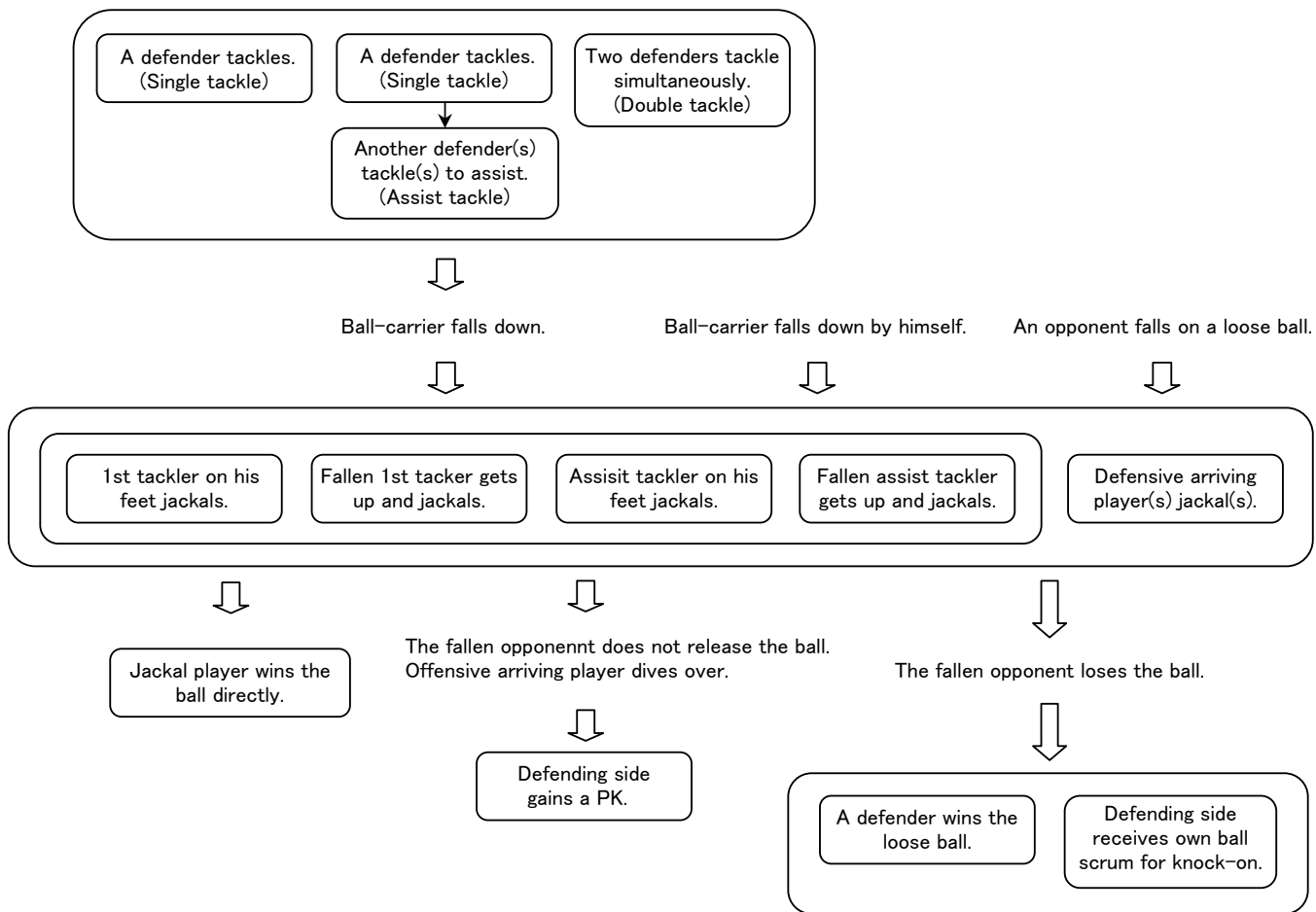


Figure 5 Occurrence sequence of jackal turn-over

tackler stood up and jackalled were fewer. These consisted of 4 cases of single and 1st & assist tackles respectively. All the 4 cases of 1st & assist tackles were included in the jackals in which the assist tackler fallen on the ground when tackling stood up and attempted.

Among jackals done by the arriving player, those after the opponent had been tackled by a single tackle occurred most frequently, with 23 cases identified, while the jackals the arriving player did after double and 1st & assist tackles were much fewer, 6 cases and 2 cases respectively. The probable reason why the jackals the arriving player performed after the collaborative tackles were so few is that one of two or three tacklers frequently attempted to jackal before the arriving player reached in the collaborative tackle situation.

**3.3.5. Sequence of occurrence of Ruck turn-overs**

Analyzing and sorting the process of turn-overs of the 22 ruck turn-over plays identified, the sequential occurrence of ruck turn-overs was schematized as

appearing in **Figure 6**. This figure illustrates three different sequences of the ruck turn-over play. The first is a sequence when either the ball was seized by forming a ruck after the opponent ball carrier fell to the ground with his head toward the defending side and driving beyond the ball, or that a PK was gained after a foul the opponent committed after a ruck was formed. Six cases of these were identified. The second is a sequence either that the ball or a PK was gained after forming a ruck after the opponent ball carrier was tackled with the ball twined, or that the attacking scrum afterwards was caught by ruck-pile, and 11 cases were identified. These key plays which lead to turn-overs are tackles either in which the opponent ball carrier falls to the ground with his head toward the defending side or where the tackler wraps around the ball. Out of the former tackles, 2 were gained through single tackles, 4 by 1st & assist tackles, and out of the latter tackles 2 were attained by single tackle, 1 by a double tackle, and 8 by 1st & assist tackles, with the majority being collaborative tackles.

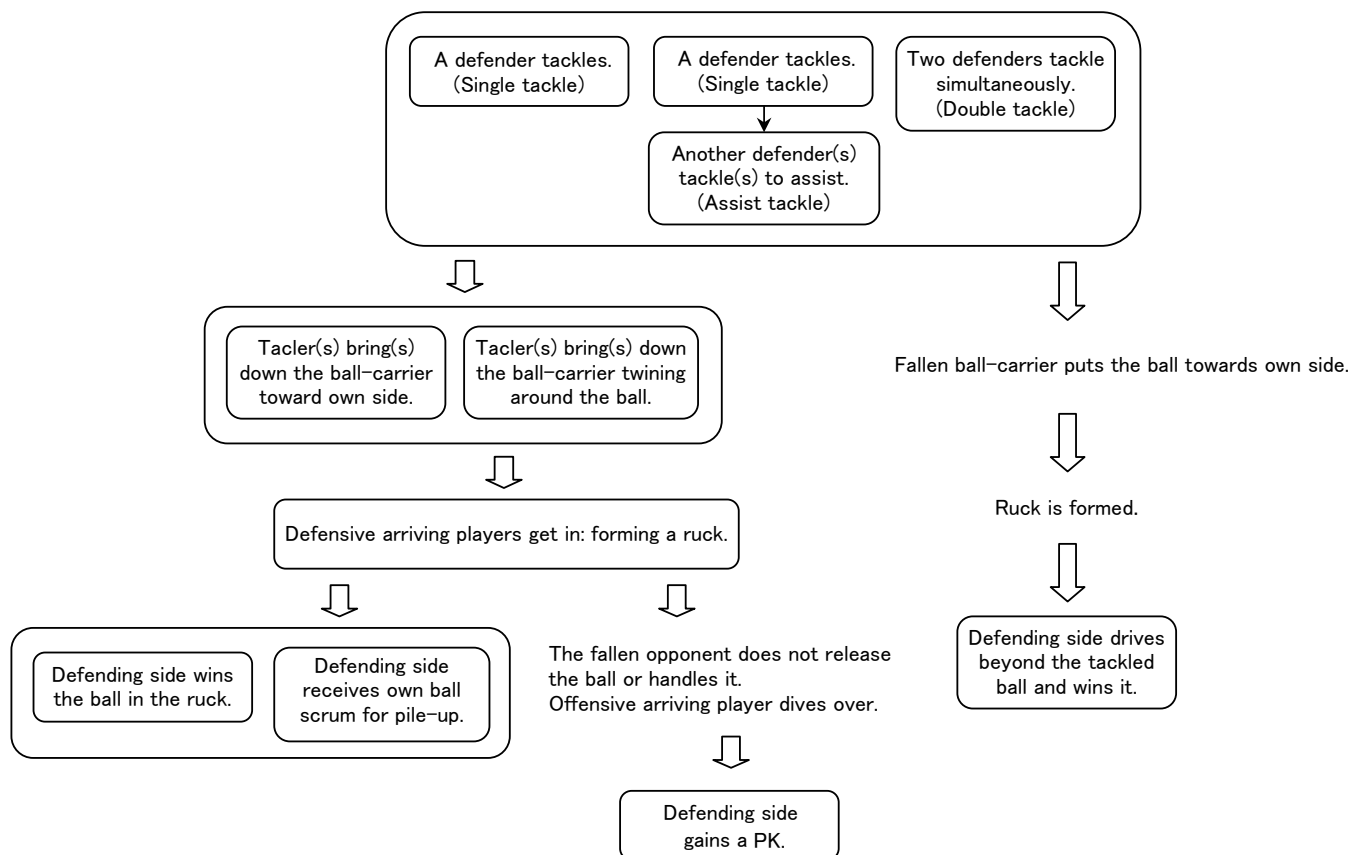


Figure 6 Occurrence sequence of ruck turn-over

The last sequence is where the ball the opponent possessed was captured by hard driving over the ruck after the opponent's placing the ball towards the attacking side after being tackled. Although the turn-overs in the third sequence identified were much fewer at only 5 cases, the mechanism seems to be essentially different from the other two since the ruck expected to be won by the opponent was turned over.

### 3.3.6. Mechanism of occurrence of Maul turn-overs

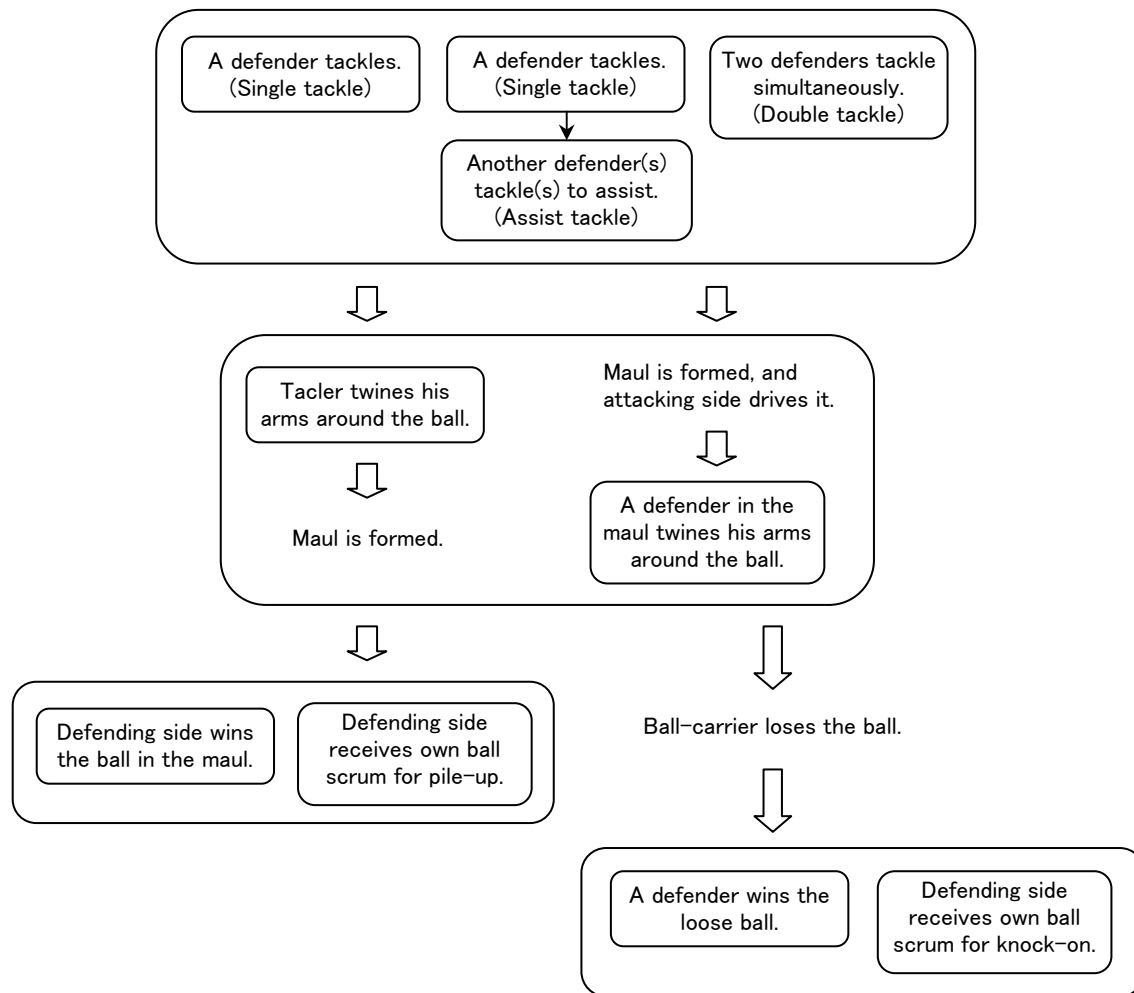
Analyzing and sorting the process of 16 maul turn-over plays, the sequential occurrence of maul turn-overs was schematized as appearing identified in Figure 7. This figure illustrates that there were two major sequences of maul turn-overs. The first is where the maul was formed after twining the ball followed by the possession seized with scrum by maul-pile or that the ball was directly seized in the maul. Five cases of turn-over caused by maul-pile were identified, while only 1 case of turn-over caused by direct seizure of the ball was identified.

The second maul turn-over is when the ball is seized in the opponent ball's maul formed by

the opponent's ripping the ball carrier, or that the possession is gained with the scrum by maul-pile, or that the loose ball after a knock-on is seized, or that attacking scrum is gained by the knock-on. Ten cases of turn-over in this sequence were identified, with 7 out of 10 being turn-overs caused by mauls formed after a line-out.

## 4. Conclusion

The purpose of this study was to demonstrate the efficacy of turnovers as attacking point and to clarify the mechanism of occurrences of turn-overs in contact situations. To gain data for this purpose, 15 top-ranking, high level international rugby matches were selected as samples to be analyzed. Regarding the efficacy of turn-overs as attacking point, attacking plays resulting from turn-overs in contact situations were compared with those starting from scrums and line-outs. The analyzed data find that the former led to better performance in terms of points scored and distance advanced in attacks without kicking in addition to continuing possession in attacks with kicking. This demonstrates that turn-overs in contact



**Figure 7** Occurrence sequence of maul turn-over

situations are advantageous to work as attacking points. To clarify the mechanism of occurrence of turn-overs in contact situations, turn-overs in contact situations were classified into 5 categories according to the play which directly causing the turn-overs. These turnovers were identified as Tackle turn-overs, Tap turn-overs, Jackal turn-overs, Ruck turn-overs, and Maul turn-overs. Analyzing in details and sorting the process of turn-overs according to each category, several different sequences of occurrence of turn-overs came to light. Based on the mechanism of occurrence of turnovers revealed in this study, further studies generating techniques and tactics of turn-over play in contact situations are seen to be necessary.

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