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REKONSTRUKCIJA LANCA OPERACIJA U OBLIKOVANJU KERAMIČKOG POSUĐA S RANOSREDNJOVJEKOVNOG GROBLJA RAZBOJINE KOD KAŠIĆA

RECONSTRUCTION OF THE *CHAÎNES* *OPÉRATOIRES* IN THE SHAPING OF CERAMIC VESSELS FROM THE EARLY MEDIEVAL CEMETERY OF RAZBOJINE NEAR KAŠIĆ

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U radu su predstavljeni rezultati analize tehnike oblikovanja keramičkog posuđa s ranosrednjovjekovnog groblja Razbojine kod Kašića. Upotrebom jasno definiranog metodološkog okvira za makroskopsku analizu tehnike gradnje glinenim valjcima uz određeni doprinos rotacijskog oblikovanja, svojstvene ručnom kolu, identificirane su različite strategije s obzirom na stupanj iskorištavanja rotacijskih mogućnosti ručnog kola. Po svojim ciljevima, ova studija predstavlja odmak od tradicionalnog morfološkog-stilskog pristupa prevladavajućeg u hrvatskoj arheološkoj literaturi o ranosrednjovjekovnoj keramici, u kojoj često nedostaju detaljni opisi tehnike oblikovanja. Rekonstruirana su tri lanca operacija u oblikovanju koja nude dublji uvid u lokalnu tehničku tradiciju i određenu tehnološku raznolikost unutar naizgled homogene skupine keramičkog posuđa, u uskoj vezi s vještinama i obukom lončara. Iako trenutačno nisu moguće izravne usporedbe s grobljima istog horizonta u regiji, rezultati su stavljeni u kontekst sličnih analiza ranosrednjovjekovne keramike s nalazišta dublje u unutrašnjosti. Istraživanjem je istaknuta potreba za sveobuhvatnijim istraživanjem lončarstva ručnoga kola na teritoriju ranosrednjovjekovne Hrvatske.

KLJUČNE RIJEČI: ručno kolo, *chaînes opératoires*, tehnika izrade keramike, tehnička tradicija, ranosrednjovjekovna keramika, Dalmacija



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Open Access Ovaj rad dijeli se prema odredbama i uvjetima licence Creative Commons Attribution 4.0 International license (<https://creativecommons.org/licenses/by/4.0/>), koja dopušta neograničenu ponovnu upotrebu, dijeljenje i reprodukciju u bilo kojem mediju, pod uvjetom da je izvorno djelo ispravno citirano.

This paper presents the results of an analysis of ceramic vessel shaping techniques from the early medieval cemetery of Razbojine near Kašić. Employing a clearly defined methodological framework for the macroscopic analysis of wheel-coiling – a technique characteristic of hand-wheel use – the study identifies distinct strategies in the utilization of the hand-wheel's rotational capabilities. In its objectives, this research departs from the traditional morpho-stylistic approach still prevalent in Croatian archaeological literature on early medieval ceramics, which often lacks detailed descriptions of shaping techniques. Three *chaînes opératoires* have been reconstructed, providing deeper insights into local technical traditions and revealing technological diversity within a seemingly uniform ceramic assemblage, closely linked to potters' skills and training. While direct comparisons with contemporary cemeteries in the region are currently not possible, the results are contextualized against similar analyses of early medieval ceramics from sites further inland. This study emphasizes the need for more comprehensive investigations into hand-wheel traditions and craftsmanship in early medieval Croatia.

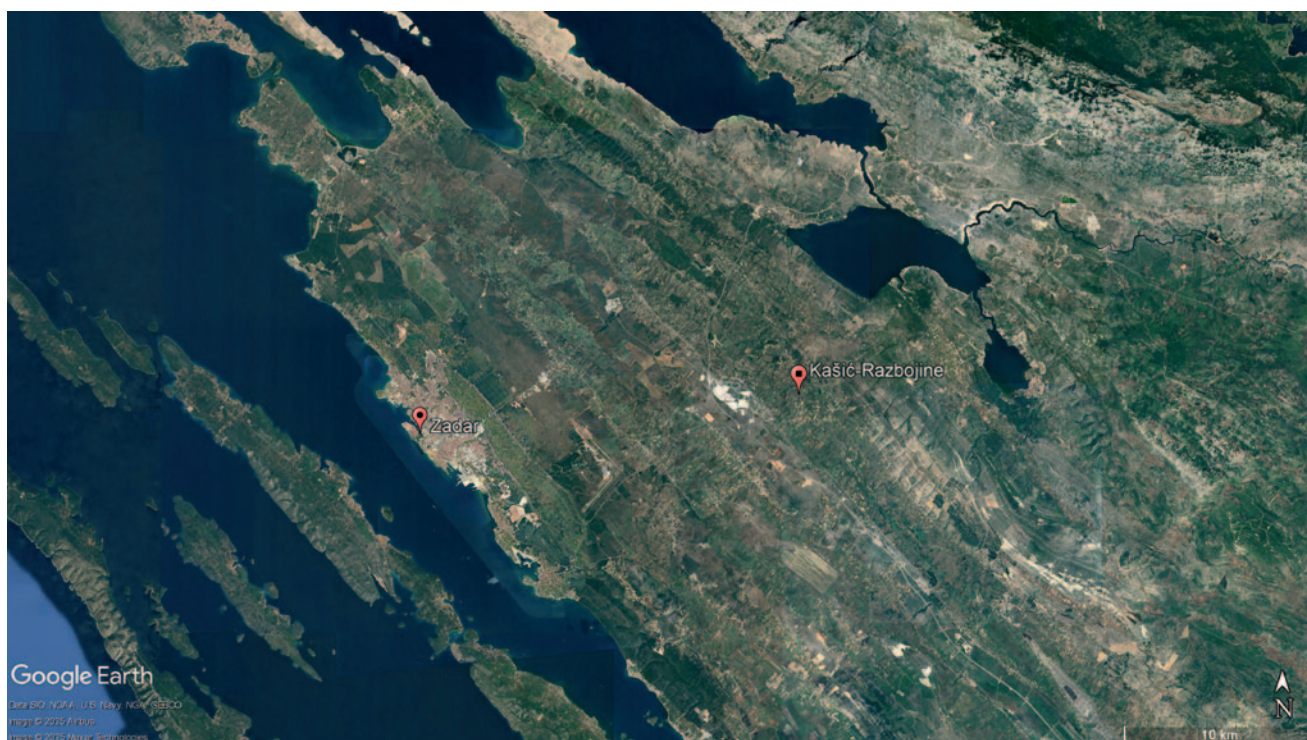
KEY WORDS: hand-wheel, operational chain, ceramic fashioning technique, technical tradition, early medieval pottery, Dalmatia

UVOD

Keramičko posuđe vrlo je prepoznatljiv i čest prilog u ranosrednjovjekovnim grobovima iz 8. i prve polovice 9. stoljeća na području šireg zadarskog zaleđa. Jedno od groblja iz tog razdoblja, po obilježjima materijalne kulture, otkriveno je na položaju Razbojine u istočnome dijelu Kašićkog polja nedaleko od Kašića Donjeg (karta 1). Zaštitna istraživanja rubnog dijela groblja, inače devastiranog poljoprivrednim radovima, provedena su 1956. godine od strane D. Jelovine iz Muzeja hrvatskih arheoloških spomenika (Jelovina 1968: 23–24; Belošević 1980: 48–49). Istraženo je 37 grobnih cjelina, a još jedna otkrivena je na njivi 50-ak metara sjeverozapadno od iskopa. Jelovina (1968: 46–47) u svojoj analizi grobnog inventara daje pregled morfološko-stilskih karakteristika te osnovne podatke o oblikovanju keramičkih posuda – na ručnom lončarskom kolu, s ponekad primjetnim ručnim modeliranjem. Njegovi zaključci na tragu su ostalih analiza keramičkog materijala na drugim tada objavljenim grobljima istog horizonta (Nin – Materiza: Belošević 1962: 241–246; Kašić – Glavčurak: Belošević 1968: 233–234), no ne odudaraju značajnije od standardnog pristupa obradi koji se primjenjuje i u novije vrijeme (npr. Nin – Ždrijac: Belošević 2007: 301–310; Kašić – Maklinovo brdo: Belošević 2010: 118–126; Krneza – Duševića glavica: Gusar, Vujević 2012: 119–120). Detaljniji opisi

INTRODUCTION

Ceramic vessels are highly recognizable and frequent grave goods in early medieval graves from the 8th century and the first half of the 9th century in the wider Zadar hinterland. One of the cemeteries from this period, identified based on the characteristics of material culture, was discovered at Razbojine in the eastern part of the Kašić field, not far from Kašić Donji (Map 1). Rescue excavations of the marginal part of the cemetery, which had otherwise been damaged by agricultural activity, were conducted in 1956 by D. Jelovina from the Museum of Croatian Archaeological Monuments (Jelovina 1968: 23–24; Belošević 1980: 48–49). Thirty-seven graves were investigated, and another one was discovered in a field about 50 meters northwest of the trenches. In his analysis of the grave inventory, Jelovina (1968: 46–47) provides an overview of the morphological and stylistic features, as well as basic information on the shaping of ceramic vessels – produced on a hand-wheel, with occasional evidence of hand modelling. His conclusions are consistent with other analyses of ceramic material from previously published cemeteries of the same horizon (Nin – Materiza: Belošević 1962: 241–246; Kašić – Glavčurak: Belošević 1968: 233–234) and do not differ significantly from the standard analytical approach applied in more recent times (e.g., Nin – Ždrijac: Belošević 2007: 301–310; Kašić – Maklinovo brdo: Belošević 2010: 118–126; Krneza – Duševića glavica: Gusar, Vujević 2012: 119–120).



Karta 1 – Položaj lokaliteta Kašić – Razbojine (podloga: Google Earth. Data SIO, NOAA, U.S. Navy, NGA, GEBCO. Image © 2025 Airbus, Image © 2025 Maxar Technologies; obrada: P. Jeršek)

Map 1 – Position of the Kašić – Razbojine site (base: Google Earth. Data SIO, NOAA, U.S. Navy, NGA, GEBCO. Image © 2025 Airbus, Image © 2025 Maxar Technologies; processing by: P. Jeršek)

postupka oblikovanja zapravo nisu prisutni, najčešće se radi o vrlo šturim, čak generičkim opisima.¹ Nadalje, primjetan je i manjak kriterija na temelju kojih se donose zaključci o korištenju ručnoga kola. Oni se svode na uobičajenih jedan do dva atributa – trag osovine kola te paralelne vodoravne linije. Primjenom recentnijih spoznaja i uz jasno definirani metodološki okvir upotpunile bi se dosadašnje spoznaje o ranosrednjovjekovnom lončarstvu na području Dalmacije. Uz to, mogla bi se provoditi ciljana istraživanja o lončarskom obrtu i vještinama onodobnih lončara. Upravo relativno velika zastupljenost i dobra očuvanost keramičkih priloga na grobljima ovog horizonta nudi mogućnost potpunije i vjerodostojnije analize načina oblikovanja posuđa. Analiza keramičke građe s Razbojina i rekonstrukcija lanca operacija u oblikovanju tek je prvi korak u tom smjeru.

More detailed descriptions of the shaping process are generally absent; existing accounts are mostly very brief and often generic.¹ Furthermore, there is a noticeable lack of criteria upon which conclusions about the use of a hand-wheel are based. These are typically reduced to one or two attributes – the trace of the wheel axle and horizontal parallel lines. By applying recent findings and using a clearly defined methodological framework, the current understanding of early medieval pottery from Dalmatia could be improved. In addition, targeted research could be conducted on the pottery craft and the skills of potters from this period. The relatively large number and good preservation of ceramic finds in cemeteries of this horizon offer the possibility for a more comprehensive and reliable analysis of vessel shaping techniques. The analysis of ceramic material from Razbojine and the reconstruction of the operational chains is only the first step in this direction.

¹ Bekić (2016: 162–174) u svojoj sintezi o ranosrednjovjekovnoj keramici daje kraći pregled keramičkih nalaza iz Dalmacije, koje pak ne obrađuje sistematično već iznosi opći zaključak o sličnostima u načinu oblikovanja s keramikom njegove grupe Drava-Mura-Sava (Bekić: 82–83, 99–100).

¹ In his book on early medieval ceramics, Bekić (2016: 162–174) provides a brief overview of ceramic finds from Dalmatia, which he does not analyze systematically, but from which he draws a general conclusion about similarities in manufacturing techniques with the ceramics of his Drava-Mura-Sava group (Bekić 2016: 82–83, 99–100).

OBLIKOVANJE NA RUČNOM KOLU: TEORIJA, PRAKSA I TERMINOLOGIJA

Osnovni princip analize oblikovanja keramičkog posuđa uključuje prepoznavanje i interpretaciju dijagnostičkih značajki koje upućuju na primijenjene postupke, pokrete i alate, koji utječu na izgled površinskog sloja stijenki ili pojavnost raznih deformacija (Rye 1981: 58; Roux 2019: 140). Dosad je najviše napora usmjereno na precizniju interpretaciju upravo površinskih značajki oblikovanja na rotacijskim instrumentima. One predstavljaju zaostale tragove oblikovanja stijenki vidljivih na makroskopskoj razini, što je pristup koji se najčešće primjenjuje, a ovisno o mogućnostima kombinira se s ostalim skalama promatranja (mezo- i mikrorazina).² Istraživanja ovog načina oblikovanja keramike od početka imaju naglašenu etnografsku-eksperimentalnu komponentu koja je omogućila uspostavljanje referentnih okvira za primjenu na arheološkom materijalu (Thér 2020: 3).³ Ključno istraživanje provele su Roux i Courty (1998) koje su najzaslužnije za jasnije definiranje tehnike oblikovanja tipične za ručno kolo. Radi se o kompozitnoj tehnici koja kombinira gradnju posude glinenim valjcima (eng. *coils*) i primjenu rotacijske kinetičke energije (dalje RKE), odnosno vrtnje kola (eng. *wheel-coiling*).⁴ Pokazale su da unutar tehnike postoje četiri metode s različitim ukupnim doprinosom rotacijskog kretanja u oblikovanju, diferencirane zavisno o tome od koje faze u lancu operacija – polaganje valjaka, spajanje valjaka, stanjivanje, oblikovanje forme

HAND-WHEEL POTTING TECHNIQUE: THEORY, PRACTICE, AND TERMINOLOGY

The basic principle for analyzing ceramic shaping techniques is the recognition and interpretation of diagnostic features that indicate the procedures, movements, and tools used, which influence the appearance of the surface layer of the vessel walls or result in various deformations (Rye 1981: 58; Roux 2019: 140). In the context of shaping with rotary instruments, most efforts to date have focused on the more precise interpretation of surface features. They represent residual traces of wall shaping that are visible at the macroscopic level. This approach is the most commonly used and, where possible, is combined with other scales of observation (meso- and microscopic).² From the outset, research into (hand-)wheel fashioning has had a distinct ethnographic-experimental component, which has made it possible to create a frame of reference for application to archaeological material (Thér 2020: 3).³ Key research was carried out by Roux and Courty (1998), who were responsible for more precisely defining the shaping technique typical of the hand-wheel. Wheel-coiling represents a composite technique in ceramic production that integrates vessel construction using clay coils with the application of rotational kinetic energy (hereafter RKE).⁴ They have demonstrated that within this technique, four distinct methods exist, each characterized by varying degrees of RKE utilization. These methods differ according to the specific phase of the production sequence in which rotational movement is em-

- 2 Na mezoskali se promatra keramička struktura svježih presjeka pri malom povećanju, dok se uvid u mikrostrukturu dobiva pomoću optičke mikroskopije petrografskih tankih izbrusaka (Albero Santacreu 2014: 77; Roux 2019: 154–158; Thér 2020: 13). Kako pristup koji uključuje mezo- i mikrorazinu promatranja podrazumijeva dostupnost keramičkih ulomaka, njegova primjena otežana je kod cjelovitog posuđa, uključujući i ono s Razbojina.
- 3 U Hrvatskoj nije došlo do bitnijeg povezivanja etnografskih istraživanja tradicijskog lončarstva ručnoga kola dalmatinske regije (za lončarstvo otoka Iža v. Oštrić 2005: 226–231, za Potravlje v. Petrić 1979; Jenjić 2018) i arheološke struke. Etnografskim istraživanjima dobiveni su vrijedni uvidi u način funkcioniranja takve proizvodnje, sirovine, izgled ručnog kola, alate, strategiju sušenja i pečenja.
- 4 Inicijalno se u engleskom jeziku za tehniku koristio termin *wheel-fashioning* kojim su objedinjene kompozitne tehnike koje primjenjuju RKE; po svojoj kompleksnosti i raširenosti najviše se ističe kombinacija u kojoj se osnovni obris željenog oblika posude postiže gradnjom glinenih valjaka uvis. S vremenom dolazi do diferenciranja pojedinih tehnika unutar krovnog pojma tako da je danas općeprihvaćen termin *wheel-coiling* za iznad opisanu tehniku (v. Roux 2009; Roux, de Miroschedji 2009; Jeffra 2011; 2015; Rückl, Jacobs 2016). Još se ponekad susreće termin *wheel-fashioning* umjesto *wheel-coiling* (nedavno npr. Banning 2020: 196, donekle i Ceccarelli et al. 2021). Autorica se opredjeljuje za konzistentno korištenje termina *wheel-coiling*, v. englesku verziju teksta.

- 2 At the meso level, the ceramic structure of fresh sherd sections is observed at low magnification, while insights into the microstructure are gained through optical microscopy of petrographic thin sections (Albero Santacreu 2014: 77; Roux 2019: 154–158; Thér 2020: 13). Since the approach involving meso- and microscopic observations requires the availability of ceramic sherds, its application to fully preserved vessels – including those from Razbojine – is difficult.
- 3 In Croatia, there has been no significant connection between ethnographic research on traditional hand-wheel pottery in Dalmatia (for pottery from the island of Iž, see Oštrić 2005: 226–231; for Potravlje, see Petrić 1979; Jenjić 2018) and archaeology. Ethnographic research has provided valuable insights into the functioning of such production, including information on raw materials, the appearance of the hand-wheel, tools, and drying and firing strategies.
- 4 The term “wheel-fashioning” was initially employed to describe composite techniques utilizing RKE. Among them, the technique of constructing vessel’s basic outline through coiling gained particular prominence due to its complexity and widespread use. As research progressed, a more nuanced differentiation of individual techniques within this broader category emerged. Consequently, the term “wheel-coiling” has become widely accepted in academic discourse to specifically denote this technique (e.g., Roux 2009; Roux, de Miroschedji 2009; Jeffra 2011; 2015; Rückl, Jacobs 2016). It is worth noting that the term “wheel-fashioning” continues to appear in some contemporary literature, occasionally used interchangeably with “wheel-coiling” (recently e.g., Banning 2020: 196, and to a certain extent, Ceccarelli et al. 2021). The Author opts for the consistent use of the term wheel-coiling.

– se iskorištava potencijal RKE (Roux, Courty 1998: 748–750; Roux 2019: 84–87). Tako se kod metode 1 RKE, odnosno kontinuirana vrtanja kola koristi tek po sastavljanju, spajanju i stanjivanju glinenih valjaka, a kod metode 4 u svim koracima oblikovanja (tab. 1). Ovo je temeljno načelo formiranja i oblikovanja zidova posude, dok za dno na koje se polažu glineni valjci u obzir dolaze i ostale tehnike prostoručnog oblikovanja, ne samo slaganje valjaka. Kako su njihovom shemom predstavljeni samo različiti stupnjevi korištenja RKE, bez uključivanja drugih tehnika sekundarnog oblikovanja koje se također mogu uključiti u proces oblikovanja, mogućnosti su u stvarnosti još brojnije. Upravo zato interpretacija zahtijeva ne samo identifikaciju tehniku/e i metode oblikovanja, već specifičnih slijedova operacija u formiranju posuđa.

played: coil laying, coil joining, coil thinning, or basic shaping (Roux, Courty 1998: 748–750; Roux 2019: 84–87). In method 1, for example, the continuous rotation of the wheel is used only after the assembly, joining, and thinning of the coils, whereas in method 4, it is employed in all steps of the shaping process (Tab. 1). This principle is fundamental to vessel wall formation and shaping, while the vessel base, upon which coils are placed, may utilize alternative roughing-out techniques beyond coiling. Since this scheme primarily outlines varying degrees of RKE utilization, without accounting for the various secondary shaping techniques that may be incorporated into the forming process, the practical possibilities are even more numerous. This is precisely why interpretation requires not only the identification of the technique(s) and method of shaping, but also the recognition of specific sequences of operations in vessel formation.

	slaganje valjaka / coil positioning	spajanje valjaka / coil joining	stanjivanje / thinning	oblikovanje / shaping
M1	bez RKE (non-RKE)			RKE
M2	bez RKE (non-RKE)		RKE	
M3	bez RKE (non-RKE)	RKE		
M4	RKE			

Tab. 1 – *Wheel-coiling* metode s obzirom na način iskorištavanja RKE (prema: Roux, Courty 1998: 750, tab. 1; Roux, Jeffra 2015: 171, tab. 4; izradila: P. Jeršek)

Tab. 1 – *Wheel-coiling* methods in relation to RKE utilization (after: Roux, Courty 1998: 750, Tab. 1; Roux, Jeffra 2015: 171, Tab. 4; made by: P. Jeršek)

U novije vrijeme se ovom tematikom bavi nešto veći broj autora, od kojih su neki doprinijeli dubljem razumijevanju procesa oblikovanja na ručnom kolu i tipičnih dijagnostičkih tragova, naročito C. Jeffra (2011; 2015; Rückl, Jacobs 2016; Choleva 2012; 2020; Choleva, Jung, Kardamaki 2020). Ipak, njihov istraživački interes obuhvaća keramiku iz ranijih vremenskih razdoblja i drugih regija, ponajviše egejsko brončano i rano željezno doba, a rjeđe mlađih razdoblja, npr. 10. – 11. stoljeće na području Šleske (Rzeźnik 1995) ili 13. – 15. stoljeće na području Bohemije i Moravske (Slaviček, Těsnohlídková 2021; Těsnohlídková 2022). Kronološki, geografski i kulturološki najbliže, stoga u ovom kontekstu najrelevantnije na taj način obrađivano keramičko posuđe potječe iz kontinentalne Hrvatske, s lokaliteta 7. – 9. stoljeća iz okolice Koprivnice (Sekelj Ivančan, Kudelić 2015, u formi konferencijskog postera), te zapadne Mađarske, s lokaliteta Zalavár-

In recent years, this subject has attracted increased scholarly attention, with several authors contributing to a more nuanced understanding of the wheel-coiling technique and its associated diagnostic traces, notably C. Jeffra (2011; 2015; Rückl, Jacobs 2016; Choleva 2012; 2020; Choleva, Jung, Kardamaki 2020). However, their research focuses on ceramics from earlier periods and other regions, predominantly the Aegean Bronze Age and Early Iron Age, with limited exploration of later periods such as 10th–11th century Silesia (Rzeźnik 1995) or 13th–15th century Bohemia and Moravia (Slaviček, Těsnohlídková 2021; Těsnohlídková 2022). The most relevant examples, in terms of chronological, geographical, and cultural proximity, are ceramic vessels from continental Croatia – specifically 7th–9th century sites near Koprivnica (Sekelj Ivančan, Kudelić 2015, conference poster) – and from western Hungary, at Zalavár-Vársziget site, dated

Vársziget, datirano u drugu polovicu 9. stoljeća (Mersdorf 2007). Jedna od bitnijih rasprava u tom pogledu jest i razlikovanje keramike izrađivane tehnikama svojstvenih ručnom i tzv. brzom kolu (npr. Courty, Roux 1995; Choleva 2012; Roux 2019: 178–185).

U relevantne atribute i kategorije tragova od interesa pri prepoznavanju tehnike gradnje valjcima i primjenu RKE u oblikovanju ubraja se morfologija i topografija površine (oblik i raspored udubina, izbočina ili linija kao odraz stupnja modifikacije s RKE), varijacije u debljini zidova, tragovi spojeva među strukturnim elementima (valjcima) te selektivno lomljenje duž spojeva (Rye 1981: 59–65; Roux, Courty 1998: 751–753, 756–760; Roux 2019: 142–146, 160–165, 180–182; Choleva 2012: 353–354, 356–357; Rückl, Jacobs 2016: 302–308; Thér 2020: 8–9). Konačna ocjena temelji se isključivo na prisutnosti više dijagnostičkih atributa specifičnih za oblikovanje na ručnom kolu jer značajna je upravo njihova kombinacija (Roux 2019: 140–142). Za analizu je pogodnije što cjelovitije posude koje je pomalo nesavršeno, nemarno ili manje vješto oblikovano – inače će izostati dio dijagnostičkih značajki neophodnih za detektiranje ne samo tehnike, već i konkretne metode oblikovanja. Naime, velika usitnjenost keramičkog materijala postavlja određena ograničenja u interpretaciji.

Pri interpretaciji uočenih tehnoloških tragova treba biti posebno oprezan zato što neki od njih mogu biti posljedica srodnih tehnika. Jedan od takvih dvosmislenih tragova su primjerice tanke, paralelno orijentirane površinske linije, sasvim uobičajene za formiranje posuda i na ručnom i brzom kolu (Rye 1981: 64, 79, sl. 62: c; Rice 2005: 134; Roux 2019: 178–179). Iz tog razloga može doći do nedoumica posebno kod analize manjih ulomaka. Za brzo kolo tipična je tehnika postupnog „izvlačenja“ stijenki posude iz grude gline, oslanjajući se u potpunosti na kontinuiranu rotaciju velike brzine (eng. *wheel-throwing*; Rye 1981: 74–80), što je suštinski različit princip oblikovanja. Međutim, na ručnom kolu ipak se može ostvariti veća brzina okretanja, zaslužna za stvaranje takvih linija kod kontinuiranog pritiska na stijenku, samo što ono tu brzinu ne može zadržati dugo jer se ne može nastaviti okretati vlastitim zamahom poput „brzog“ lončarskog kola, obično na nožni pogon (Rice 2005: 134; Miller 2007: 114–115; Berg 2020: 2). Usporava ga trenje koje lončar stvara svojim rukama te se bez dodatne aktivacije u konačnici zaustavlja puno brže u usporedbi

to the second half of the 9th century (Mersdorf 2007). One of the most significant discussions in this field concerns the distinction between wheel-coiled and wheel-thrown ceramics (e.g., Courty, Roux 1995; Choleva 2012; Roux 2019: 178–185).

Attributes and categories of traces relevant to identifying the wheel-coiling technique include surface morphology and topography (the shape and arrangement of depressions, protrusions, or lines reflecting the degree of modification with RKE), variations in wall thickness, evidence of joints between assembled elements (coils), and preferential fracturing along these joints (Rye 1981: 59–65; Roux, Courty 1998: 751–753, 756–760; Roux 2019: 142–146, 160–165, 180–182; Choleva 2012: 353–354, 356–357; Rückl, Jacobs 2016: 302–308; Thér 2020: 8–9). Definitive assessment relies solely on the presence of *multiple* diagnostic attributes specific to wheel-coiling, as it is their combination that is significant (Roux 2019: 140–142). For analytical purposes, vessels that are (mostly) complete and exhibit some imperfections or less skillful shaping are more suitable, as they are more likely to retain the diagnostic features necessary for identifying not only the technique but also the specific shaping method. It is worth noting that high fragmentation of ceramic material imposes certain limitations on interpretation.

Interpreting observed technological traces requires particular caution, as certain features may result from related techniques. One such ambiguous trace is the presence of thin, parallel striations across the surface of the vessel wall, which are common in vessels formed both on the hand-wheel (wheel-coiling) and the (fast) wheel (wheel-throwing) (Rye 1981: 64, 79, Fig. 62: c; Rice 2005: 134; Roux 2019: 178–179). As a result, uncertainties may arise, particularly when examining smaller ceramic fragments. In wheel-throwing, the vessel is formed by gradually „pulling up“ the walls from a lump of clay, relying entirely on continuous high-speed rotation (Rye 1981: 74–80) – a fundamentally different shaping principle. However, a hand-wheel can achieve the higher rotational speeds responsible for creating such lines with continuous pressure on the wall, but it cannot maintain that speed for extended periods, as it lacks the sustained momentum of a “fast-wheel”, which is typically foot-powered (Rice 2005: 134; Miller 2007: 114–115; Berg 2020: 2). The friction generated by the potter’s hands decelerates the wheel, and without additional activation, it ultimately ceases rotation

s kolom koje funkcionira na principu momenta sile – što je razlika koja nije presudna za formiranje paralelnih vodoravnih linija. Upravo iz tog razloga termini *sporo kolo*, *spororotirajuće kolo* i *sporovrteće kolo*, koji se u domaćoj literaturi koriste kao sinonimi za ručno kolo, nisu dovoljno precizni pa ih se može smatrati kolkvijalnim nazivima, što je na neki način i pojam *brzo kolo*.⁵ Od svih navedenih termina u uporabi stoga je najprimjereniji termin *ručno kolo* koji prvenstveno odražava način aktivacije, a manje tehničke mogućnosti koje su mogle varirati od primjerka do primjerka, o kojima znamo nedovoljno. Naime, nema sačuvanih ranosrednjovjekovnih ručnih kola, kao najbližije analogije možemo uzeti tek modernije primjerke iz šire regije (sl. 1). Ručna kola međusobno se razliku-

more rapidly than a wheel operating on the principle of torque – a distinction that is not critical for the formation of parallel horizontal striations. Consequently, terms such as “slow wheel” and “slow-rotating wheel”, which are used in Croatian literature as synonyms for “hand-wheel”, lack precision and may be considered colloquial, as is the term “fast wheel”.⁵ Among the various terms in use, “hand-wheel” emerges as the most appropriate, as it primarily reflects the method of activation rather than the technical capabilities, which could vary between specimens and about which our knowledge remains insufficient. Notably, no early medieval hand-wheels have been preserved; the closest analogies available are more recent specimens from a broader regional context, dating to the late 19th century (Fig. 1).



Sl. 1 – Nisko drveno ručno kolo usađeno u drveno podnožje, moguće iz istarskog Raklja (inv. br. PPMHP 105689; © Pomorski i povijesni muzej Hrvatskog primorja Rijeka, uz dozvolu)

Fig. 1 – Hand-wheel set into a wooden base, possibly from Rakalj in Istria (inv. no. PPMHP 105689; © Maritime and History Museum of the Croatian Littoral in Rijeka, with permission)

5 Da se u razvijenom i kasnom srednjem vijeku koristi kolo na nožni pogon i kolo koje se pokreće štapom mogu posvjedočiti onodobni likovni prikazi lončara (v. Slaviček, Těsnohlídková 2021: 10, Figs. 7–8; Těsnohlídková 2021: 24–26, s literaturom).

5 The use of kick-wheels (foot wheels) and cartwheels (stick wheels) in the High and Late Middle Ages is attested by contemporary illustrations of potters (see Slaviček, Těsnohlídková 2021: 10, Figs. 7–8; Těsnohlídková 2021: 24–26, with references).

ju po konstrukciji (pomična ili nepomična osovina, radna ploča kola postavljena na osovini ili pak prolazi kroz nju) i montaži (usađena u razne vrste podnožja) (usp. Hołubowicz 1965: 187; Gavazzi 1978: 27–31; Petrić 1979: 353–355; Rzeźnik 2018: 9–10).

Istraživanja keramičke tehnologije dublji smisao pronalaze kroz definiranje lanaca operacija u postupku izrade keramičkog posuđa i s njime povezanog socioekonomskog konteksta. Tako tehnički lanci (fr. *chaînes opératoires*) predstavljaju jedinstvene skupove operacija koje se vrše određenim redoslijedom i na određeni način kako bi se izradilo posuđe istih obliježja (Albero Santacreu 2014: 53–59; Miloglav 2016: 43–58; Roux 2019: 283–285). Uključuju sve tehnološke izbore u postupku izrade (pri kupljanje i priprema sirovina, oblikovanje, sušenje, pečenje), unutar kojeg posebno mjesto ima proces oblikovanja zbog svoje vremenske stabilnosti i vezanosti uz specifična znanja i motoričke vještine koje je potrebno učiti (Roux 2020: 20). Tehnološko znanje prenosi se među majstorima, tako stvarajući naslijeđene obrasce kojima se lončari vode pri oblikovanju i svim ostalim koracima u proizvodnji keramike, tako čineći tehničku tradiciju karakterističnu za određeni društveni kontekst (Albero Santacreu 2014: 56–57; Roux 2019: 217).

METODOLOGIJA

U rekonstrukciji procesa oblikovanja keramičkih grobnih priloga s lokaliteta Razbojine u Kašiću primijenjen je makroskopski pristup s ciljem identificiranja i detaljne karakterizacije tehničkih operacija i gesti na temelju vidljivih tragova, te njihovog slijeda u procesu oblikovanja. Pritom glavna motivacija nije samo jasnija argumentacija zaključka o primijenjenoj tehnici, odnosno rotacijskoj napravi za svaku pojedinu posudu, već prepoznavanje razlika u metodama, pogotovo u vezi sa stupnjem modifikacije zidova pomoću RKE, te definiranje specifičnih lanaca operacija.

Vršen je vizualni pregled keramičke građe kojim su pod kvalitetnim osvjetljenjem uočavani tragovi oblikovanja vidljivi golim okom ili pod manjim povećanjem (lupa). Iznimna pozornost posvećena je topografiji, odnosno reljefu zidova u cijelosti, kako vanjskih tako i unutarnjih površina, u punoj visini posuda. Analiza polazi od široko prihvaćenih kriterija za identifikaciju značajki povezivih s formiranjem osnovnog

Hand-wheels exhibit variations in construction (movable or fixed axle, wheel head positioned on or passing through the axle) and mounting (embedded in diverse base types) (cf. Hołubowicz 1965: 187; Gavazzi 1978: 27–31; Petrić 1979: 353–355; Rzeźnik 2018: 9–10).

Research into ceramic technology acquires deeper significance through the characterization of operational sequences in vessel production and their associated socioeconomic contexts. These technical chains (Fr. *chaînes opératoires*) represent unique sets of operations performed in a specific order and manner to produce vessels with consistent characteristics (Albero Santacreu 2014: 53–59; Miloglav 2016: 43–58; Roux 2019: 283–285). They encompass all technological choices within the production process, including raw material selection and preparation, shaping, drying, and firing. Within this framework, the shaping process occupies a privileged position due to its temporal stability and its connection to specific knowledge and motor skills acquired through apprenticeship (Roux 2020: 20). Technological knowledge is transmitted among craftsmen, creating inherited patterns that guide potters in shaping and all subsequent steps of ceramic production. This process establishes technical traditions characteristic of specific social contexts (Albero Santacreu 2014: 56–57; Roux 2019: 217).

METHODOLOGY

In reconstructing the vessel formation processes for ceramic grave goods from the Razbojine site in Kašić, a macroscopic approach will be employed to identify and describe in detail the technical operations and gestures based on visible traces, as well as their sequence in the shaping process. The primary objective is not only to provide clearer arguments for conclusions regarding the technique or rotary device used for each individual vessel, but also to identify differences between methods – particularly in terms of the degree of wall modification by RKE – and to define specific *chaînes opératoires*.

A comprehensive visual examination of the ceramic material was conducted under high-quality lighting, allowing for the observation of shaping traces either with the naked eye or under low magnification (using a magnifying glass). Particular attention was devoted to the examination of wall topography – that is, the relief of the vessel walls in their entirety, including both exterior and interior surfaces, as well as upper and lower sections. The

oblika posude slaganjem glinenih valjaka te primjene rotacijskih pokreta u određenim stadijima oblikovanja (Roux, Courty 1998; Roux 2019; Jeffra 2011; 2015; Choleva 2012; Rückl, Jacobs 2016). Također, konzultirana je online zbirka referentnog eksperimentalnog materijala Technothèque Jacques Tixier (Technologie et Ethnologie des Mondes Préhistoriques – TEMPS), a u interpretaciji pomogao je i manji broj tipološki srodnih posuda, koje je autorica izradila na modernoj reprodukciji ručnog kola.

Proučavani uzorak uključuje 13 posuda: 12 cijelih i jedne sa sačuvanim samo donjim dijelom, od toga 12 S-profiliranih lonaca, te jednog vrča bez ručke (tab. 2). Lonci se mogu svrstati u više tipova ovisno o proporcijama i obliku tijela: lonci okruglog tijela i šireg otvora (tip A1), lonci s maksimalnim promjerom tijela u visini ramena (tip A3), lonci šireg tijela, maksimalnog promjera u visini ramena i naglašene S-profilacije (tip A5).⁶ Lonac iz grobne cjeline 13 ne može se sa sigurnošću pripisati nijednom od opisanih tipova. Keramička struktura relativno je

analysis is based on widely accepted criteria for identifying features associated with the wheel-coiling technique (Roux, Courty 1998; Roux 2019; Jeffra 2011; 2015; Choleva 2012; Rückl, Jacobs 2016). Furthermore, the online collection of reference experimental material from the Technothèque Jacques Tixier (Technologie et Ethnologie des Mondes Préhistoriques – TEMPS) was consulted, and a small number of typologically similar vessels, fashioned by the author on a modern reproduction of a hand-wheel, also aided in the interpretation.

The sample studied includes 13 vessels: 12 complete and one with only the lower part preserved. Of these, 12 are S-shaped pots and one is a jug without a handle (Tab. 2). The pots can be classified into several types based on their proportions and body shape: type A1, pots with a round body and a wider opening; type A3, pots with a maximum diameter at shoulder height; and type A5, pots with a broader body, maximum diameter at shoulder height, and pronounced S-curvature.⁶ The pot from grave 13 cannot be confidently attributed to any of these described types. The cera-

Kašić – Razbojine								
grob / grave	inv. br. / inv. no.	visina / height	Ø otvora / rim Ø	max. Ø	Ø dna / base Ø	Ø otiska osovine / axle imprint Ø	tip / type	<i>chaîne opératoire</i>
5	MHAS 2790	11.6	7	9.7	7.9	-	B	1
6	MHAS 2793	10.8	9.9	10.5	6	1.7	A1	2
13	MHAS 2800	13.6	10.8	12	8.8	-	A	2
15	MHAS 2803	10.5	9.5	11.5	6.9	-	A1	3
16	MHAS 2804	16.2	12.2	15.5	8.6	-	A5	1
17	MHAS 2807	11.4	8.9	11.5	7	1.6	A3	1
19	MHAS 2809	9.4	9.1	9.8	6.5	2.1 x 1.7	A1	2
27	MHAS 2815	13.5	10.4	12.3	8	1.5	A3	1
29	MHAS 2816	10.5	9.9	10.3	7.8	-	A3	1
30	MHAS 2817	11.2	8.7	10.2	7.3	-	A3	2
32	MHAS 2821	11.3	9.4	11.4	8.7	1.7	A3	2
33	MHAS 2822	14.7	10.9	15.5	10.3	1.7	A5	2
36	MHAS 2828	11*	-	-	8	2	A	2*
sluč. otkriveni grob / accid. disc. grave	MHAS 2832	8.6	8.9	9.5	6.2	2.2	A1	2

Tab. 2 – Lista keramičkih grobnih priloga s Razbojina u Kašiću – dimenzije (u cm), tipologija i *chaînes opératoires* (izradila: P. Jeršek)

Tab. 2 – List of ceramic grave goods from Razbojine in Kašić – dimensions (in cm), typology, and *chaînes opératoires* (made by: P. Jeršek)

6 Prema objedinjenoj tipologiji za keramiku s objavljenih groblja u regiji. Na ovom lokalitetu nisu prisutni svi dosad evidentirani tipovi lonaca. Zastupljeni tipovi detaljnije su opisani u Jeršek 2026.

6 According to the consolidated typology for ceramics from the published cemeteries in the region. Not all recorded types of pots are present at this site. The represented types are described in more detail in Jeršek 2026.

gruba, s velikom količinom mineralnih primjesa čija usitnjenost varira među posudama (obično 1–5 mm).

Uzorak omogućuje pouzdanu tehnološku analizu, zadovoljen je uvjet od barem 10 cjelovitijih posuda određenog oblika (Rye 1981: 59). Jedini primjerak vrča s lokaliteta, iz groba 5, poslužit će za dodatnu komparaciju. Manje dimenzije posuda i relativno uski vratovi otežavali su opažanje i dokumentiranje tragova u unutrašnjosti keramičkih posuda. Također, unutrašnje stijenke lonaca često prekriva zaoštali karbonizirani talog stoga su tragovi nekih operacija u oblikovanju na tim dijelovima slabije vidljivi.

ANALIZA KERAMIČKIH GROBNIH PRILOGA IZ RAZBOJINA

Svi keramički prilozi s groblja Razbojine oblikovani su na ručnom kolu tehnikom koja objedinjuje prostoručno sastavljanje tijela glinenim valjcima i rotacijske mogućnosti kola. Dijagnostički tragovi koji na to upućuju raznovrsni su i brojni, no ipak, ne pronalaze se svi tragovi na svakom primjerku posude, niti u istoj mjeri, niti sasvim istih atributa. Može ih se kategorizirati u dvije skupine: pokazatelji vezani uz gradnju posude nizanjem konstruktivnih elemenata kojima se stvara osnovni volumen, te pokazatelje koji su rezultat postupaka vršenih uz pomoć RKE. U svojoj objavi groblja, Jelovina (1968: 25–39, 46–47) donosi oskudne podatke o načinu oblikovanja, te se često ne referira na konkretne tragove oblikovanja na temelju kojih donosi sud o primijenjenoj tehnici, odnosno korištenju ručnog kola. To čini samo u jednom slučaju, kada opisuje otiske osovine ručnog kola kao vrlo jasne tragove smještaja posuda na radnu ploču kola. Na postojanje paralelnih koncentričnih linija upućuje tek indirektno, konstatacijom da su posudama vratovi „pažljivo dotjerani pomoću lončarskog kola“ (Jelovina 1968: 46). Okrugli otisak osovine nalazi se na više od pola posuda (57 %), što je relativno velika pojavnost, no i tako ne obuhvaća cijeli uzorak. Naposljetku, čak i prisustvo otisaka ne govori o postupku oblikovanja ništa više osim da je korišteno ručno kolo, a paralelne koncentrične linije same za sebe upućuju samo na primjenu rotacije tokom formiranja. Stoga je za rekonstrukciju slijeda postupaka u oblikovanju optimalno da

mic fabric is relatively coarse, with a large amount of mineral temper whose grain size varies between vessels (usually 1–5 mm).

The sample size meets the methodological requirement of at least 10 complete vessels of a specific type (Rye 1981: 59), thereby ensuring the reliability of the technological analysis. The jug from grave 5 will serve as an additional point of comparison. The smaller dimensions of the vessels, combined with their relatively narrow necks, presented challenges for the observation and documentation of internal surface features. Moreover, the frequent presence of carbonized residues on the interior walls of the vessels occasionally obscured traces of certain shaping operations in these areas.

ANALYSIS OF CERAMIC GRAVE GOODS FROM RAZBOJINE

All ceramic grave goods from the Razbojine cemetery were wheel-coiled on a hand-wheel. The diagnostic traces indicating this are diverse and numerous; however, not all traces are present on every vessel, nor to the same extent or with the same attributes. They can be categorized into two groups: indicators related to the vessel's construction by coiling, and indicators resulting from application of RKE. In his publication on the cemetery, Jelovina (1968: 25–39, 46–47) provides limited information regarding vessel fashioning techniques. He often does not explicitly refer to specific shaping traces that would support his conclusions about the technique used or the use of a hand-wheel. He does so only in one instance, when he describes hand-wheel axle impressions as clear evidence for the positioning of vessels on the wheel head. He only indirectly alludes to the presence of parallel concentric striations, noting that the vessel necks were “carefully finished using a potter’s wheel” (Jelovina 1968: 46). The circular axle impression is present on more than half of the vessels (57%), which is a relatively high occurrence; however, it does not encompass the entire sample. The presence of wheel axle impressions, while indicative of hand-wheel usage, does not provide comprehensive information about the entire shaping process. Similarly, parallel concentric striations alone merely suggest the presence of rotation during vessel forming. Therefore, for the reconstruction of the sequence of shaping operations, it is optimal to identify a combination of traces from *both* categories on each vessel, or at least on a significant proportion of the assemblage.

se na svakoj posudi, ili barem na značajnom broju posuda, pojavljuje određen broj tragova iz *obje* kategorije.

Izdvojene su tri različite sekvence tehnoloških radnji u procesu oblikovanja (fr. *chaînes opératoires*; tab. 2). Lanac operacija 1 prepoznat je na loncima iz grobova 16, 17, 27 i 29 te posudi iz groba 5, moguće čaši ili manjem vrču bez ručke (T. 1: 5, 16–17; 2: 27, 29).⁷ Dno je oblikovano ručno, iz grude gline, i postavljeno na sredinu pokretne ploče kola. Otiske osovine kola imaju samo lonci iz grobnih cjelina 17 i 27, a utisnuti su po sredini dna. U oba slučaja riječ je o udubljenjima, a promjeri su im gotovo isti – 1,6 cm kod lonca iz groba 17 te 1,5 cm kod lonca iz groba 27. Otisak s lonca iz groba 17 prekriven je koncentričnim linijama, što sugeriše da je drvena osovina ručnog kola, na kojem je oblikovan, bila pomična (sl. 4: b),⁸ za razliku od osovine kola na kojem je rađen lonac iz groba 27, koja je proizvela i vrlo plitko udubljenje (sl. 4: a). Na bazu se do visine ramena posude slažu glineni valjci, polaganjem svakog novog valjka na gornju plohu prethodno položenog valjka. Ove „kobasice“ formirane su valjanjem gline u rukama ili po ravnoj površini. Valjci kojima se formira trbuh nešto su dulji kako bi se na tom dijelu već u ranoj fazi ostvarilo postupno proširivanje koje odgovara željenoj formi. Redovi valjaka bit će kraći na gornjem dijelu, a slaganje privremeno staje kod točke najvećeg sužavanja. Prilagodba duljine valjaka nudi veću kontrolu forme od samog početka, no nužna je također zbog ograničenih mogućnosti znatnije izmjene u kasnijoj fazi oblikovanja.

Obrisu valjaka tek se naslućuju u zidovima završenih proizvoda, i to prvenstveno na vanjskoj stijenci (sl. 2: 1b). Oni tvore blagu valovitost površine primjetnu duž cijelog profila svih lonaca, a samo gornjeg dijela posude iz grobne cjeline 5. Valjci su spajani diskontinuiranim pritiscima,⁹ a spojevi se nalaze na razmjerno tanjim dijelovima zida. Njihovo spajanje izvedeno je vrlo pažljivo, nema zaostalih procjepa ili linearnih fisura koje bi upućivale na nepot-

Three distinct sequences of technological operations (Fr. *chaînes opératoires*; Tab. 2) have been identified within the ceramic assemblage. *Chaîne opératoire* 1 is observed in pots from burials 16, 17, 27, and 29, as well as in a vessel from grave 5 – a smaller handleless jug or cup (Pl. 1: 5, 16–17; 2: 27, 29).⁷ The base was manually formed from a clay mass and subsequently positioned at the center of the wheel head. Only the vessels from graves 17 and 27 have wheel axle impressions, which are centrally located on their bases. In both instances, these impressions manifest as depressions with similar diameters: 1.6 cm for the vessel from grave 17 and 1.5 cm for the vessel from grave 27. The impression on the vessel from grave 17 is covered with concentric lines, indicating the use of a hand-wheel with a movable wooden axle (Fig. 4: b).⁸ This contrasts with the wheel employed for the pot from grave 27, which produced a very shallow depression without concentric lines, suggesting a fixed axle configuration (Fig. 4: a). The vessel construction process involved stacking coils on the base up to shoulder height, with each coil positioned atop the previous one. These coils were formed by rolling the clay between the palms or on a flat surface. The coils used to form the middle part of the body were slightly longer, allowing for gradual expansion and the desired shape to be achieved early in this area. Shorter coils were employed for the upper portion of the vessels. The stacking process was temporarily suspended at the point of maximum constriction. Adjusting the coil length provides better control over the morphology of the vessel at an early stage and is also necessary because of the limited possibilities for significant alterations in the later stages.

The outlines of the coils are subtly discernible in the walls of the finished products, primarily on the exterior surface (Fig. 2: 1b). They appear as slight undulations along the entire profile of all pots, except for the vessel from grave 5, where they are evident only in the upper portion. Coils were joined by discontinuous pressures,⁹ and the joints are located on relatively thinner parts of the wall. The joining was carried out very carefully, leaving no linear fissures that would indicate incompletely joined coils.¹⁰ A single short

7 Za crteže v. Jelovina 1968: 26, sl. 11 (grob 5); 31, sl. 15 (grob 16), 16 (grob 17); 34, sl. 18 (grob 27); 35, sl. 19 (grob 29); Belošević 1980: T. LIV: 6 (grob 5); LX: 4 (grob 29); LXIII: 5 (grob 17).

8 Usp. Rzežnik 2018: 8–9, sl. 1: a.

9 Da su spajani pomoću RKE, valovitost bi bila izraženija zbog pritiska različite jačine kojima se vrši spajanje. Naime, kontinuiranim pritiscima uz vrtnju kola došlo bi do razdvajanja valjaka (Roux, Courty 1998: 752; Roux 2019: 188). Pomicanje gline okomitim ili kosim diskontinuiranim pritiscima bez RKE može se smatrati učinkovitijom metodom spajanja, iza koje puno rjeđe ostaju vidljivi sami spojevi u obliku nepravilnih vodoravnih linija (fisura).

7 For drawings, see Jelovina 1968: 26, Fig. 11 (grave 5); 31, Fig. 15 (grave 16), 16 (grave 17); 34, Fig. 18 (grave 27); 35, Fig. 19 (grave 29); Belošević 1980: Pl. LIV: 6 (grave 5); LX: 4 (grave 29); LXIII: 5 (grave 17).

8 Cf. Rzežnik 2018: 8–9, Fig. 1: a.

9 The application of RKE during the coil-joining process would result in more pronounced undulations due to intermittent pressures; continuous pressures while the wheel is rotating would cause the coils to separate (Roux, Courty 1998: 752; Roux 2019: 188). Moving the clay with vertical or oblique discontinuous pressures, without RKE, can be considered a more efficient joining method, as it significantly reduces the frequency of visible joints manifesting as irregular horizontal lines or fissures.

10 For comparison, ceramic vessels from Zalavár occasionally exhibit traces



Sl. 2 – Keramički lonci iz grobne cjeline 17 (1a–b), 16 (2a–b) i 29 (3a–b) – tragovi oblikovanja na ručnom kolu na vanjskom zidu, nije u mjerilu (izradila: P. Jeršek)

Fig. 2 – Ceramic pots from graves 17 (1a–b), 16 (2a–b), and 29 (3a–b) – wheel-coiling traces on the outer wall, not to scale (made by: P. Jeršek)

puni spoj.¹⁰ Jedna kraća ravna linija na vanjskoj stijenci lonca iz groba 17, smještena neposredno prije dna, potencijalno bi mogla odgovarati tom opisu ili bi se pak mogla smatrati lomom duž spoja. Mjesto spoja dva valjka na istom loncu može se prepoznati u horizontalnom obrascu loma središnjeg dijela tijela. Naime, linija loma prati pružanje blagog horizontalnog udubljenja između dva obla ispupčenja, gdje je zid nešto tanji (sl. 2: 1b, isprekidane strelice). Spojevi, kao mjesta kontakta između valjaka, predstavljaju slabije dijelove u strukturi zida, sklonije lomu.¹¹ Prije dodavanja zadnjih

straight line on the outer wall of the pot from grave 17, situated just above the base, may correspond to this description or may be interpreted as a fracture along the joint. The position of the joint between two coils on the same pot can be recognized by the horizontal fracture pattern in the central part of the body. The fracture line follows the direction of a horizontal depression between two undulations, where the wall is somewhat thinner (Fig. 2: 1b, dotted arrows). The joints, as contact points between the coils, represent weaker parts of the wall structure that are more susceptible to fracture.¹¹ Before the last rows of coils

¹⁰ Usporedbe radi, na keramičkom posuđu iz Zalavára ponekad se susreću tragovi vertikalnog i kosog spajanja s unutrašnje strane vrata (v. Mersdorf 2007: 204, sl. 7: 1–3, 5).

¹¹ Moglo bi se ustvrditi da načelno postoji određeni oprez prema povezivanju obrasca loma s tehnikom oblikovanja te ga neki stručnjaci smatraju problematičnom kategorijom koja ovisi o više različitih faktora (van der Leeuw 1976: 245–246, 309; Jeffra 2011: 124), dok ih, s druge strane,

of vertical and oblique joining on the interior surfaces of their necks (see Mersdorf 2007: 204, Fig. 7: 1–3, 5).

¹¹ One could argue that, in principle, a certain degree of caution is required when linking fracture patterns to shaping techniques. Some experts consider this to be a problematic category, as it depends on several different factors (van der Leeuw 1976: 245–246, 309; Jeffra 2011: 124). On the other hand, some experimental studies suggest that it can be a valid indicator of the wheel-coiling technique (Rückl, Jacobs 2016: 305, 309–310).



Sl. 3 – Keramički lonci iz grobne cjeline 17 (a) i 27 (b) – tragovi rotacijskog oblikovanja na unutarnjem zidu, nije u mjerilu (izradila: P. Jeršek)

Fig. 3 – Ceramic pots from graves 17 (a) and 27 (b) – traces of rotational shaping on the inner wall, not to scale (made by: P. Jeršek)

redova valjaka koji će biti oblikovani u otvor, vrši se stanjivanje zidova. Taj korak izveden je uz pomoć rotacije kola, čemu u prilog govori kompaktnost i tek blago nepravilna topografija zida. Veća transformacija stijenci u vezi je s korištenjem RKE ne samo pri konačnoj modifikaciji oblika, već i u prethodnoj fazi stanjivanja (Roux, Courty 1998: 750–751). U odnosu na konačnu modifikaciju oblika, stanjivanje općenito zahtijeva kontinuiranu vrtnju kola manje brzine jer pritisci kojima se ostvaruje moraju biti nešto jači. Stanjivanje i modificiranje unutrašnjosti bilo bi otežano da je posuda odmah sastavljena u punoj visini. Dodavanjem otvora i njegovim povezivanjem s ostatkom tijela završava gradnja posude.

Fine površinske vodoravne i koncentrične linije na vanjskoj i unutarnjoj stijenci jasan su indikator primjene rotacijskih pokreta u operacijama stanjivanja i finaliziranja oblika. Tipičan su trag nastao primjenom kontinuiranog pritiska na zid posude tokom vrtnje kola, pri čemu dodatak vode smanjuje trenje (Rye 1981: 64; Roux, Courty 1998: 751–752; Jeffra 2011: 137–139). Njihova neprekinutost i koncentrično pružanje bitno je obilježje pri razlikovanju od linija nastalih zaglađivanjem koje mogu teći u različitim smjerovima, pa i horizontalno. Linije nastale rotacijskim oblikovanjem u načelu prekrivaju cijelu površinu posuda ove skupine, od otvora do dna, po vanjštini (sl. 2, pune strelice) i unutrašnjosti (sl. 3). Vanjska stijenska posuda redovito je dobro oblikovana, a unutarnja stijenska poka-

are added and formed into the opening, the walls are thinned. This step was carried out with the rotation of the wheel, as evidenced by the compact nature and slightly irregular topography of the wall. The stronger transformation of the walls is associated with the use of RKE not only for roughout shaping but also for thinning (Roux, Courty 1998: 750–751). Compared to final shape modification, thinning generally requires continuous rotation of the wheel at a lower speed, as the pressure must be somewhat stronger. Thinning and modifying the interior would have been more difficult if the vessel had been assembled immediately to its full height. The construction of the vessel is completed by adding the opening and joining it to the rest of the body.

The presence of fine horizontal and concentric surface striations on both the outer and inner walls is a clear indication of the use of rotational movements for thinning and final shaping. These characteristic traces are created by applying continuous pressure to the vessel wall while the wheel is rotating, with the addition of water to reduce friction (Rye 1981: 64; Roux, Courty 1998: 751–752; Jeffra 2011: 137–139). The continuity and concentric pattern of these striations is an important distinguishing feature that differentiates them from smoothing striations, which can run in various directions, including horizontally. Striations produced by rotational shaping generally cover the entire surface of the vessels in this group, from rim to base, both on the exterior (Fig. 2, full arrows) and interior (Fig. 3). The outer walls of the vessels are typically well regularized, and the interior walls exhibit considerable uniformity and a significant degree of transformation.¹² However, the parallel lines

pojedina eksperimentalna istraživanja ipak podržavaju kao validan pokazatelj ove tehnike (Rückl, Jacobs 2016: 305, 309–310).

¹² Jelovina (1968: 46) describes the inner walls of all ceramic vessels from the site as quite uneven.

zuje veliku ujednačenost i značajan stupanj transformacije.¹² Paralelne linije jedva su primjetne i teže se prate samo na unutrašnjoj stijenci lonca iz grobne cjeline 29, naspram vanjske na kojoj su puno primjetnije. Osim što je istrošena učestalim korištenjem, te stoga prekrivena brojnim pukotinama, čini se da s unutrašnje stijenke najvećim dijelom izostaju kontinuirane linije upravo zbog slabijeg vlaženja unutrašnjosti kod rotacije. Kako proces formiranja zbog nizanja i spajanja valjaka može potrajati, sama glina postupno gubi na plastičnosti i postiže tvrdoću kože (eng. *leather-hard*), tako da dodavanje vode utječe ponajprije na površinski sloj zida koji je već poprilično kompaktan. Unutrašnja stijenka tog lonca previše je pravilna da bi mogla nastati isključivo nerotacijskim oblikovanjem.

Blaga asimetričnost oblika evidentirana je tek na dva lonca – primjerku iz groba 17 u jednu je stranu uvinuto tijelo i otvor, dok je primjerku iz groba 27 ukošen samo otvor. To ukazuje da su posude u načelu bile dobro centrirane na radnoj ploči kola te upućuje na dobru kontrolu pokreta i spretnost lončara. Pomalo kvrgava i gruba površina vanjskog zida lonaca iz grobova 17 (sl. 2: 1a), 27 i 29 (sl. 2: 3a) nije u vezi s nekom od operacija u oblikovanju, nego sa stezanjem gline u fazi sušenja. Time se primjese u smjesi povlače bliže površini, ali

on the inner wall of the pot from grave 29 are barely noticeable and difficult to follow, in contrast to the outer wall, where they are much more pronounced. The inner wall is not only worn from frequent use and covered with thermal spalls, but also appears largely free of fluidized lines. This absence is probably due to insufficient humidification of the interior during rotational shaping. The production of a coil-built basic shape is time-consuming, during which the clay gradually loses its plasticity and reaches a leather-hard state. Consequently, the addition of water primarily affects the surface layer of the wall, which has already become quite compact. The regularity of this pot's inner wall suggests that it could not have been produced exclusively through non-rotational shaping.

A slight asymmetry in shape was observed in only two pots: a tilted body and opening in the pot from grave 17, and a tilted opening in the pot from grave 27. This indicates that the vessels were generally well centered on the wheel head and suggests good control of movement and skill on the part of the potter. The slightly uneven and bumpy surface of the outer walls of the pots from graves 17 (Fig. 2: 1a), 27, and 29 (Fig. 2: 3a) is not related to any of the shaping operations, but rather to the contraction of the clay during the drying phase. This process draws the temper closer to the surface, although it remains covered by a layer of clay (Shepard 1985: 187–188; Roux 2019: 197, sl. 3.52: f).



Sl. 4 – Keramički lonci iz grobne cjeline 27 (a), 17 (b) i 29 (c) – tragovi podizanja s ručnog kola i otisci osovine kola, nije u mjerilu (izradila: P. Jeršek)

Fig. 4 – Ceramic pots from graves 27 (a), 17 (b), and 29 (c) – traces of lifting from the hand-wheel and wheel axle imprints, not to scale (made by: P. Jeršek)

ostaju prekrivene slojem gline (Shepard 1985: 187–188; Roux 2019: 197, sl. 3.52: f).

The final operations include smoothing the outer wall without rotation, altering the rim, and decorating the body, all of which vary from vessel to vessel. The smoothing of the outer surface with oblique and/or vertical strokes can be described

¹² Jelovina (1968: 46) pak unutarnju stijenku svih keramičkih posuda s lokaliteta opisuje kao prilično neravnu.

U posljednje operacije ubraja se zaglađivanje vanjštine bez upotrebe rotacije, dodatno oblikovanje ruba i ukrašavanje, čija primjena varira od posude do posude. Zaglađivanje vanjske površine kosim i/ili okomitim potezima može se okarakterizirati kao minimalno na loncima iz grobova 17 i 29, umjereno na posudi iz groba 5 i loncu iz groba 27, te izrazito u slučaju lonca iz groba 16 (sl. 2: 2b). Tragovi zaglađivanja prelaze preko paralelnih linija nastalih kao rezultat uporabe RKE u oblikovanju. Jedino lonac iz groba 17 nema zaobljeni rub. Kod njega je rub ravno odrezan pomoću rotacije kola (sl. 2: 1a). Od ukrasa, zastupljene su ponajviše urezane horizontalne linije (grob 5, 16, 27, 29), obično u redovima, ponekad zajedno s valovnicama (grob 16 i 29) (sl. 2: 2a–b, 3a). Nalaze se na ramenima i truhu posuda, a izrađeni su pomoću vrtnje kola. Lonac iz groba 17 izdvaja se po urezanom znaku na ramenima, oblikom nalikuju strelici usmjerenoj prema gore (sl. 2: 1a). U literaturi se slični motivi najčešće interpretiraju kao moguće oznake lončara (npr. Jelovina 1968: 47; Belošević 1980: 111), no njihovu zapravo vrlo rijetku pojavu ipak treba shvatiti kao protuargument za takav zaključak.¹³ Na tri posude postoje naznake načina uklanjanja s ručnog kola. Prigodni plosnati alat gurnut je ispod dna lonca iz groba 27, u još uvijek podatnu glinu. Alat je podržavao gotovo cijelo dno lonca, pri čemu je nastala plitka udubljena ploha, a njegovim povlačenjem površina dna prekrivena je paralelnim linijama (sl. 4: a). Sličnim alatom nadignut je rubni dio dna lonca iz groba 17, tako ostavivši za sobom plosnati otisak s udubljenjem s jedne strane (sl. 4: b). Tragove s dna lonca iz groba 29 teže je interpretirati. Naime, na samim rubovima dna nalaze se četiri kratka, relativno duboka otiska postavljena u križ. Paralelne linije s jedne, a koncentrične linije s druge strane, prostiru se preko cijele površine dna (sl. 4: c). Ne doimaju se kao da su u vezi s kontaktom gotovog proizvoda s tvrdom podlogom zato što nije riječ o ogrebotinama,¹⁴ već o finim uzdignutim linijama zaobljenih rubova, nastalih na glini u plastičnom stanju. Neobičan uzorak pružanja mogao bi se barem djelomično dovesti u vezu s brisanjem dna. Čini se vjerojatnim da su

as minimal on the pots from graves 17 and 29, moderate on those from graves 5 and 27, and pronounced on the pot from grave 16 (Fig. 2: 2b). The traces of smoothing pass over the parallel lines created by rotational shaping. Only the pot from grave 17 does not have a rounded rim. Its rim is straight-edged and was cut with the wheel turning (Fig. 2: 1a). The decorations consist mainly of incised horizontal lines (graves 5, 16, 27, 29), typically arranged in rows and occasionally accompanied by wavy lines (graves 16 and 29) (Fig. 2: 2a–b, 3a). They are located on the shoulders and in the middle section of the vessels and are also executed with the wheel slowly turning. The pot from grave 17 stands out due to an incised mark on the shoulders that resembles an upward-pointing arrow (Fig. 2: 1a). In the literature, similar motifs are usually interpreted as possible potter's marks (e.g., Jelovina 1968: 47; Belošević 1980: 111). However, their notably rare occurrence should still be considered a counterargument to such a conclusion.¹³ On three vessels, there are indications of the method used for removal from the hand-wheel. A flat tool was pushed under the base of the pot from grave 27 and pressed into the wet clay. The tool supported almost the entire base, creating a flat, recessed surface, and when it was withdrawn, the bottom was covered with parallel lines (Fig. 4: a). A similar tool was used to lift the edge of the base of the pot from grave 17, leaving a shallow impression with a depression on one side (Fig. 4: b). The traces on the base of the pot from grave 29 are more difficult to interpret. At the very edges of the base, there are four short, relatively deep impressions arranged in a cross-like fashion. Parallel lines on one side and concentric lines on the other extend across the entire surface of the base (Fig. 4: c). They do not appear to be related to contact of the finished product with a hard surface, as they are not scratches,¹⁴ but rather fine, raised lines with rounded edges. The fluidized mark suggests that they were formed while the clay was still in a plastic state. The unusual pattern could, at least partially, be attributed to the wiping of the base. It seems probable that the other vessels were left to dry on the wheel, and, as the drying process weakened the suction between the vessel and the wheel head, they were subsequently removed. Considering the combination of operations with and without RKE in

13 Najveći broj analogija potječe s ninskog područja, groblja Ždrijac i Materiza (v. Belošević 1980: T. LXIII: 1–3, 6), a najbliža s groblja Glavčurak, također u Kašiću (v. Belošević 1968: T. XIV: 2).

14 Usp. Skibo 1992: 116–118, sl. 6.5.

13 The majority of analogies originate from the Nin area, specifically the Ždrijac and Materiza cemeteries (see Belošević 1980: Pl. LXIII: 1–3, 6), while the closest parallels are found at the Glavčurak cemetery, also located in Kašić (see Belošević 1968: Pl. XIV: 2).

14 Cf. Skibo 1992: 116–118, Fig. 6.5.

ostale posude ostavljene da se počnu sušiti na kolu, pa kad je zbog sušenja oslabio spoj posude i kola, s njega su uklonjene. Ako govorimo o kombinaciji operacija s i bez RKE u oblikovanju, značajke ove skupine posuda u skladu su s metodom 2 prema Roux i Courty (1998).

Chaîne opératoire 2 determiniran je na loncima iz grobova 6, 13, 19, 30, 32, 33 te loncu iz slučajno otkrivenog groba (T. 1: 6, 13, 19; 2: 30, 32–33, *).¹⁵ Razlikuje se od prvog ponajprije po stupnju uporabe RKE, no općenito imaju dosta dodirnih točki. Dno je također formirano modeliranjem glinene mase, a potom je grubi oblik posude, prvo do visine ramena, građen glinenim valjcima koji se međusobno spajaju diskontinuiranim pritiscima. Dno su općenito debela, jedino je dno lonca iz groba 13 dosta tanko. Dok je posipavanje ploče ručnog kola zabilježeno jedino u slučaju posude iz slučajno otkrivenog groba, većina ih ima otisak osovine (pet od sedam). Lonci iz grobnih cjelina 6 i 33, te primjerak iz slučajno otkrivenog groba imaju kružna udubljenja (promjer 1,7–2,2 cm), a lonci iz grobnih cjelina 19 i 32 blago ispupčene kružne otiske (promjer 1,7–2,1 cm). Ispupčeni otisci nastaju kada osovina kola nije u liniji sa zakretnom pločom na kojoj stoji posuda, već već je nešto niža.¹⁶ Da dno lonaca iz grobova 6, 19 i naknadno otkrivenog groba, za razliku od ostalih lonaca ove skupine, nije bilo postavljeno posve po sredini zakretne ploče kola, govori položaj otiska s manjim odklonom u stranu (sl. 7: 1b, 3). Ovakve pogreške u prosudbi lončara, ili pak nemarnost, već u samom početku postupka oblikovanja mogu utjecati na konačan oblik posude, što se najčešće neće toliko odraziti na funkcionalnost posude koliko na cjelokupni estetski dojam. Izostaju koncentrični tragovi unutar otisaka, stoga se može zaključiti da su korištena ručna kola imala fiksnu osovinu, odnosno osovinu koja se ne vrti. Preostala dva lonca, iz grobova 13 i 30, morala su biti izrađena na tipu ručnog kola kojem se osovina montira s donje strane zakretne ploče.

Tehničke značajke lonaca ukazuju da je

shaping, the characteristics of this group of vessels are consistent with method 2 as described by Roux and Courty (1998).

Chaîne opératoire 2 was identified on the pots from graves 6, 13, 19, 30, 32, 33, and the pot from the accidentally discovered grave (Pl. 1: 6, 13, 19; 2: 30, 32–33, *).¹⁵ It differs from the first *chaîne* primarily in the degree of RKE utilization, though the two share numerous similarities. The base is also formed by modelling the clay mass, after which the rough shape of the vessel – initially up to shoulder height – is constructed with clay coils joined by discontinuous pressures. The bottoms are generally thick, with the exception of the pot from grave 13, which has a notably thin bottom. While dusting of the wheel head is recorded only in the case of the vessel from the accidental grave, most specimens (five out of seven) exhibit an axle imprint. Pots from graves 6 and 33, as well as the specimen from the accidentally discovered grave, have circular depressions (diameter 1.7–2.2 cm), whereas pots from graves 19 and 32 display slightly convex circular impressions (diameter 1.7–2.1 cm). The convex impressions occur when the axis of the wheel is not aligned with the wheel head on which the vessel stands, but is slightly lower.¹⁶ The positioning of the impression with a slight deviation to the side indicates that the bases of the pots from graves 6, 19, and the later discovered grave were not placed exactly at the center of the wheel head, unlike the other pots in this group (Fig. 7: 1b, 3). Such errors in the potter's judgment, or possible carelessness in the initial phase of the shaping process, can influence the final shape of the vessel. However, this typically affects the overall aesthetic impression more than the vessel's functionality. The absence of concentric traces within the impressions suggests that the hand-wheel employed had a fixed axle, i.e., an axle that does not rotate. The remaining two pots, from graves 13 and 30, were likely produced on a type of hand-wheel where the axle is mounted on the underside of the wheel head.

The technical characteristics of the pots indicate that wall thinning was accomplished through intermittent pressures, with the wheel used solely to facilitate turning the vessel when necessary. During this operation, it is crucial that the potter

15 Za crteže v. Jelovina 1968: 26, sl. 12 (grob 6); 29, sl. 13 (grob 13); 34, sl. 17 (grob 19); 35, sl. 20 (grob 30); 37, sl. 21 (grob 32), 22 (grob 33); 40, sl. 24 (slučajno otkriveni grob); Belošević 1980: T. LXI: 8 (grob 30); LXIII: 6 (grob 6).

16 Istraživanja etnografskih primjeraka ručnih kola iz istočne Europe daju naslutiti da je jedno kolo moglo proizvesti i udubljene i ispupčene otiske na keramičkom posudu jer se radilo o prijenosnim uređajima koji su se po potrebi mogli rastaviti, pa je osovina mogla biti postavljena više ili niže u odnosu na zakretnu ploču (v. Бобринский 1962: 36–39; Rzeźnik 2018: 9, crtež 6–7, 10).

15 For drawings, see Jelovina 1968: 26, Fig. 12 (grave 6); 29, Fig. 13 (grave 13); 34, Fig. 17 (grave 19); 35, Fig. 20 (grave 30); 37, Fig. 21 (grave 32), 22 (grave 33); 40, Fig. 24 (accidentally discovered grave); Belošević 1980: Pl. LXI: 8 (grave 30); LXIII: 6 (grave 6).

16 Research on ethnographic examples of hand wheels from Eastern Europe suggests that a single wheel could produce both concave and convex impressions on ceramic vessels, as these were portable devices that could be dismantled if necessary. Consequently, the axle could be positioned either higher or lower in relation to the wheel head (see Бобринский 1962: 36–39; Rzeźnik 2018: 9, drawing 6–7, 10).



Sl. 5 – Keramički lonci iz grobne cjeline 6 (1a–b), 30 (2a–b) i 32 (3a–b) – tragovi oblikovanja na ručnom kolu na vanjskom zidu, nije u mjerilu (izradila: P. Jeršek)

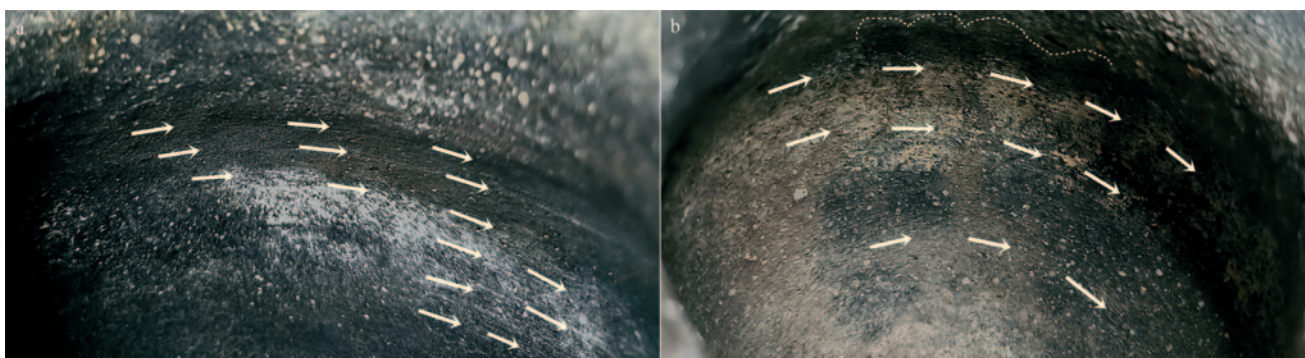
Fig. 5 – Ceramic pots from graves 6 (1a–b), 30 (2a–b), and 32 (3a–b) – wheel-coiling traces on the outer wall, not to scale (made by: P. Jeršek)

stanjivanje zidova vršeno isprekidanim potezima, pri čemu je kolo korišteno samo kao koristan alat za lakše okretanje posude. U toj operaciji važno je da lončar može manje-više nesmetano pristupiti unutrašnjosti lonaca, tako da se otvor dodaje nakon nje. Međutim, za finaliziranje oblika posuda, a naročito za profilaciju otvora, korištena je vrtnja kola. Kontinuiranim pritiscima, koji rezultiraju gustim paralelnim horizontalnim linijama, dodatno je oblikovana unutrašnja

has relatively unobstructed access to the interior of the pots, so the opening is added afterward. The rotation of the wheel was employed to finalize the shape of the vessels, particularly to profile the opening. Continuous pressures, resulting in dense parallel horizontal lines, further regularized the inner wall to its full height (Fig. 6: b), but regularized only the upper half of the outer wall (up to the middle of the body; Fig. 5: 1a–3a). This unequal treatment of the exterior and interior is the most distinctive feature of this *chaîne opératoire*. The

stijenka u punoj visini (sl. 6: b), no tek gornja polovica vanjskog zida (do sredine tijela; sl. 5: 1a–3a). Ovaj nejednaki tretman vanjštinu i unutrašnjosti najprepoznatljiviji je element ovog *chaîne opératoire*-a. To što linije u unutrašnjosti lonca iz grobne cjeline 33 ne prelaze na donju trećinu može se objasniti nešto većom visinom lonca (od 14,7 cm) u odnosu na ostale primjerke ove skupine (sl. 6: a). Možda ponajprije ova okolnost upućuje na korištenje samo jedne ruke u rotacijskom oblikovanju. Naime, tada se lončar oslanja na raspon svojeg dlana, pa ga kod viših posuda treba spustiti dublje u unutrašnjost lonca ukoliko želi učiniti pravilnijom cijelu stijenku. Nije moguće istovremeno obrađivati vanjštinu posude; oblikovanje gornjeg dijela stoga je rezultat obostranog kontinuiranog pritiska na zid prstima jedne ruke (palac – ostali prsti). Za rotacijsko oblikovanje donjeg vanjskog dijela potreban je drugačiji položaj prstiju, što se ovdje nije primjenjivalo. Stoji li iza toga nevještost, tehnička tradicija ili tek ručno kolo koje zahtijeva konstantnu aktivaciju jer će inače ubrzo stati, zapravo ostaje nejasno. Međutim, opisani stupanj primjene RKE odgovara metodi 1 po Roux i Courty (1998: 750), najmanje zahtjevnoj metodi u kojoj nije potreban napredniji stupanj koordinacije pokreta. Najjasniji pokazatelj da se spajanje valjaka i stanjivanje unutarnjeg zida

absence of lines on the lower third of the interior of the pot from grave 33 can be attributed to its slightly greater height (14.7 cm) compared to other examples in this group (Fig. 6: a). This circumstance may primarily indicate the use of only one hand during rotational shaping, as the potter relies on the span of their palm. Consequently, for taller vessels, the hand must be lowered deeper into the interior of the pot to regularize the entire wall. It is not feasible to shape the outer wall of the vessel simultaneously; therefore, the regularization of the upper part results from continuous bilateral pressure on the wall with the fingers of one hand (thumb vs other fingers). Rotational shaping of the lower outer part requires a different finger position, which was not employed in this case. Whether this is due to inexperience, technical tradition, or simply a hand-wheel that requires constant activation remains unclear. However, the described level of RKE application corresponds to method 1 according to Roux and Courty (1998: 750), the least demanding method, in which a more advanced level of movement coordination is not required. The clearest indication that the coils were joined and the inner wall thinned with discontinuous pressure is the presence of vertical finger imprints left by pulling from the belly towards the neck on a pot found in the accidentally discovered grave. The concentric lines created by rotation cross over these traces, but the pressure was evidently insufficient to eliminate the unevenness (Fig. 6: b).



Sl. 6 – Keramički lonci iz grobne cjeline 33 (a) i slučajno otkrivenog groba (b) – tragovi diskontinuiranih pritisaka i rotacijskog oblikovanja na unutarnjem zidu, nije u mjerilu (izradila: P. Jeršek)

Fig. 6 – Ceramic pots from grave 33 (a) and the accidentally discovered grave (b) – traces of discontinuous pressures and rotational shaping on the inner wall, not to scale (made by: P. Jeršek)

radilo diskontinuiranim pritiscima su okomiti tragovi povlačenja prstima od trbuha prema vratu na loncu iz slučajno otkrivenog groba. Koncentrične linije nastale rotacijom prelaze preko njih, no pritisak očito nije bio dovoljan da ukloni neravnine (sl. 6: b).

Additional modification of the outer wall was carried out by smoothing without the use of RKE, primarily on the lower part of the vessels (graves 19, 30, 33, and the accidentally discovered grave), and less frequently on the entire body (graves 6, 13, 32) (Fig. 5: 1b–3b). This smoothing followed rotati-

Dodatno ujednačavanje vanjskog zida vršeno je zaglađivanjem bez RKE, primarno donjeg dijela (grobovi 19, 30, 33, slučajno otkriveni grob), a rjeđe cijelog tijela (grobovi 6, 13, 32) (sl. 5: 1b–3b). Usljedilo je nakon rotacijskog oblikovanja, na što upućuje činjenica da su razni kosi i okomiti potezi zaglađivanja djelomično prebrisali rotacijske linije na gornjem dijelu lonaca. Predio vrata s unutrašnje strane ponekad je nedovoljno zaglađen, prekriven mnoštvom nepravilnosti na mjestu spoja otvora s ostatkom tijela, što se odnosi posebno na lonce iz grobova 13 i 33. Ravni utisci alata s vanjske strane vrata na posudama iz groba 13 i izoliranog groba sugeriraju da se profilacija otvora na tim primjercima izvodila kombinacijom rotacije i diskontinuiranih pritisaka nekog alata, najvjerojatnije za definiranje nagiba otvora. Naime, u oba slučaja tragovi alata prelaze preko paralelnih koncentričnih linija. Na loncu iz groba 13 otvor je pomalo spljošten, a utisci teku u krug, u više redova (sl. 7: 2). Na drugom primjerku, iz izoliranog groba, ravni i kosi utisci lokalizirani su samo s jedne strane te ih je općenito znatno manje.

Kao tragove primarnog oblikovanja, treba izdvojiti valoviti reljef zidova, grebene na manje vidljivim mjestima te obrasce lomova. Udubljenja nastala pomicanjem gline u fazi spajanja valjaka slabo su izražena, ali uočavaju se na pravilnim razmacima cijelom visinom posuda. Vanjska stijenka najčešće je ipak relativno dobro oblikovana (sl. 5: 2a–3a), valjci su dobro stanjeni i uklopljeni u zid, unatoč tome što se naziru mjesta njihovog spajanja. Teže dohvatljiviji dijelovi, poput prijelaza zida u dno, zbog smanjene vidljivosti, ali vjerojatno i brzine u radu mogu biti prekriveni grebenima, odnosno izrazitijim neravninama na pojedinim mjestima. Primjetno je to s unutrašnje strane lonca iz groba 13 te s vanjske strane lonca iz izoliranog groba. Vodoravni obrasci loma koji prate liniju spoja među glinenim valjcima mogu se prepoznati na loncima iz grobova 13 (sredinom tijela, prijelaz zida u dno) i 19 (tijelo, spoj vrata s tijelom). Asimetričnost forme može biti indikativna za primjenu prostoručne tehnike oblikovanja, primjerice kod lonca iz groba 6 s vrlo nepravilnom topografijom donjeg dijela (sl. 5: 1b). Kod lonca iz grobne cjeline 19 ukošenost tijela, a kod lonca iz grobnih cjelina 32 i 33 ukošeni otvori na inače skladnom obliku tijela

onal shaping, as evidenced by various oblique and vertical smoothing strokes that cross the rotational lines on the upper part of the pots. The inside of the neck is sometimes insufficiently smoothed, with numerous irregularities present at the joint between the opening and the rest of the body, which is particularly noticeable in the pots from graves 13 and 33. Flat tool impressions on the outside of the necks of the vessels from grave 13 and the isolated grave suggest that the profiling of the opening on these specimens was achieved through a combination of rotation and discontinuous pressure from a tool, most likely to define the inclination of the opening. Notably, the tool marks overlay parallel concentric lines in both cases. On the pot from grave 13, the opening is slightly flattened, and the impressions run in circular patterns in several rows (Fig. 7: 2). On the second specimen, from the isolated grave, the straight and oblique impressions are localized on only one side and are generally fewer in number.

Traces of primary shaping include undulating reliefs on the walls, ridges in less visible areas, and fracture patterns. The indentations caused by the movement of clay during the joining of the coils are faint but visible at regular intervals along the entire height of the vessels. The outer wall is generally well regularized (Fig. 5: 2a–3a), with coils well thinned and integrated into the wall, although the sections where they are joined remain visible. Areas that are more difficult to reach, such as the transition from the wall to the base, may have ridges or locally pronounced unevenness due to limited visibility and hasty execution. This can be seen on the inside of the pot from grave 13 and on the outside of the pot from the isolated grave. Horizontal fracture patterns following the joints between coils can be observed on pots from grave 13 (in the middle section of the body, at the transition of the wall to the bottom) and grave 19 (on the body, at the junction of the neck with the body). The asymmetry of form may indicate the use of hand-building techniques (coiling). For example, the pot from grave 6 exhibits a highly irregular topography in the lower part of the wall (Fig. 5: 1b). In the pot from grave 19, the skewness of the body is evident, while in the pots from graves 32 and 33, slanted openings on otherwise symmetrical bodies are observed. These features are likely side effects of the application of rotational movement and, to some extent, poorer control during shaping (especially in the pot from grave 19). Only in the case of the pot from grave 19 should the cause be attributed to off-centered placement of the vessel on the wheel head, as evidenced by the imprint on the



Sl. 7 – Keramički lonci iz grobne cjeline 6 (1a–b) – urezani motiv na ramenima, otisak osovine kola; 13 (2) – utisci alata na vratu; 29 (3) – otisak osovine kola, nije u mjerilu (izradila: P. Jeršek)

Fig. 7 – Ceramic pots from grave 6 (1a–b) – incised motif on the shoulders, wheel axle imprint; 13 (2) – tool marks on the neck; 29 (3) – wheel axle imprint, not to scale (made by: P. Jeršek)

nuspojava su primjene rotacijskog kretanja, a djelomično i lošije kontrole u oblikovanju (na- ročito kod lonca iz groba 19). Tek u slučaju lonca iz groba 19 razlog treba tražiti i u ne- centriranom smještaju posude na ploči kola, na što upućuje otisak na dnu. Ovalna forma lonca (po vodoravnoj osi) iz groba 13 također je u vezi s kombiniranjem gradnje valjcima i primjene RKE u oblikovanju. Naime, ukoliko već prije korištenja rotacije grubi oblik tijela pokazuje izrazitije nepravilnosti, do većih ko- rekcijskih teško može doći u kasnijoj fazi u kojoj se primjenjuje RKE. Čak štoviše, rotacijom se može još više naglasiti asimetričnost oblika.

Niti u ovoj grupi posuđa nisu uobičajeni do- datni zahvati u oblikovanju ruba, lonci ima- ju jednostavne zaobljene rubove. Tek lonac iz groba 33 ima koso odrezan rub. Sporija rotacija kola ipak je češće korištena za olakšavanje po- stupka ukrašavanja, redovito urezivanjem mo- tiva. Tako je izveden ukras jednostruke valov- nice koja prelazi u cik-cak liniju, postavljen na

base. The oval shape (in the horizontal axis) of the pot from grave 13 is also related to the combina- tion of coiling and rotational shaping. If the rough shape of the body exhibits significant irregularities before rotation is applied, it is unlikely that major corrections will occur at a later stage when RKE is used. Moreover, rotation can further accentuate the asymmetrical shape.

Rim alteration is also uncommon in this group of vessels. Most pots have simple rounded edges; only the one from grave 33 has a beveled edge. However, slower wheel rotation was more frequ- ently employed to facilitate the decoration pro- cess, typically through incised motifs. This tech- nique was used to create a single wavy line deco- ration, which transitions into a zigzag line on the shoulders of the vessel from grave 19. The deco- ration and overall shaping of this vessel could be described as less skilfully executed. The pot from grave 30 has a more complex decoration exten- ding from the neck to the lower third of the body (Fig. 5: 2a–b). It begins and ends with a series of

ramenima posude iz grobne cjeline 19. Ukrašavanje, kao i cjelokupno oblikovanje ovog lonca moglo bi se opisati kao manje vješto. Lonac iz groba 30 ima kompleksniji ukras, a prostire se od vrata pa do donje trećine tijela (sl. 5: 2a–b). Započinje i završava nizom koncentričnih linija, dok su u sredini postavljene nabrane višestruke valovnice u dva reda. Temeljem smjera pružanja urezanih linija ustanovljen je smjer rotacije ručnog kola – ulijevo, no valovnice su izvedene urezivanjem udesno. Oboje je sasvim tipično za dešnjake. Loncu iz groba 6 na ramenima se nalazi motiv sastavljen od više duboko urezanih ravni crta, čiji smisao je teško preciznije odrediti (sl. 7: 1a). Svojim obilježjima svrstava se u kategoriju motiva koji se tumače oznakama lončara, međutim, posve je moguće da se ipak radi samo o ukrasu. Lonac iz groba 6 najneugledniji je pripadnik ove skupine, s brojnim nesavršenostima, stoga se ne čini izglednim da bi lončar upravo njega odabrao za „potpisivanje”. Za razliku od unutrašnjosti, vanjština lonca jedva da je uopće transformirana s RKE, a mnoštvo pukotina u zidu i po dnu (nevezanih za uporabu posude) upućuje na određene probleme s glinenom smjesom (sl. 5: 1a–b, zaokruženo). Nadalje, unutrašnja ploha dna je vrlo grubo obrađena, zaostalo je puno tragova diskontinuiranih pritisaka. Na nijednom primjerku iz ove skupine posuda nema tragova koji bi se mogli dovesti u vezu s podizanjem s kola.

Necjelovito sačuvani lonac iz groba 36 ne može se sa sigurnošću pripisati ovoj skupini (T. 2: 36).¹⁷ Gornja polovica na kojoj bi se očekivale paralelne horizontalne linije nastale oblikovanjem s RKE gotovo u potpunosti nedostaje, a odudara i tretmanom unutrašnjosti isključivo diskontinuiranim pritiscima, bez rotacije. To je ostavilo brojne grebene, posebno na donjoj trećini zida, dok je dno dobro zaravnjeno. Horizontalni obrazac loma koji bi ukazao na prisutnost transformiranih valjaka u zidovima vrlo se vjerojatno može prepoznati na predjelu ramena i trbuha, u dvije paralelne krivudave linije. Udubljeni otisak osovine ukazuje na to da je lonac tijekom oblikovanja bio postavljen na kolo.

Lanac operacija 3 ustanovljen je samo na jednoj posudi s Razbojina – loncu iz grobne cjeline 15 (T. 1: 15).¹⁸ Specifičan je po kombinaciji obilježja uočenih u lancima operacija 1 i

concentric lines, while the middle section features multiple waves in two rows. Based on the direction of the incised lines, the rotation direction of the hand-wheel was determined to be leftward, while the waves were incised to the right. Both directions are typical for right-handed individuals. The pot from grave 6 has a motif on its shoulders consisting of several deeply incised straight lines, the precise meaning of which is difficult to determine (Fig. 7: 1a). Its characteristics place it in the category of motifs often interpreted as potter's marks; however, it is equally plausible that it serves solely as decoration. This pot is the least visually appealing specimen of the group and has numerous imperfections. It therefore seems unlikely that a potter would have chosen this vessel to „sign”. Unlike the interior, the exterior of the pot shows minimal transformation with RKE. The multitude of cracks in the wall and on the base (unrelated to use-wear) suggests issues with the clay paste (Fig. 5: 1a–b, circled). Furthermore, the inner surface of the base is very roughly worked, displaying numerous traces of discontinuous pressure. None of the specimens from this group of vessels exhibit traces that could be associated with lifting from the wheel.

The incompletely preserved pot from grave 36 cannot be definitively attributed to this group (Pl. 2: 36).¹⁷ The upper half, where parallel horizontal lines resulting from rotational shaping would typically be expected, is almost entirely missing. Additionally, the interior was shaped only with discontinuous pressures, without rotation. This resulted in numerous ridges, particularly on the lower third of the wall, while the base is well smoothed. A horizontal fracture pattern, which may suggest the presence of transformed coils in the walls, can most likely be identified in the shoulder and belly areas, visible as two parallel lines. Evidence that the pot was placed on a wheel during shaping is provided by the concave axle impression.

Chaîne opératoire 3 was identified on only one vessel from Razbojine – a pot from burial 15 (Pl. 1: 15).¹⁸ It is characterized by a combination of features observed in *chaînes opératoires* 1 and 2, but in terms of the method's categorization relative to the application of RKE, it aligns with the latter. This corresponds to method 1 according to Roux and Courty (1998), in which the potential of RKE is utilized solely to achieve the final geometric

¹⁷ Za crtež v. Jelovina 1968: 40, sl. 23.

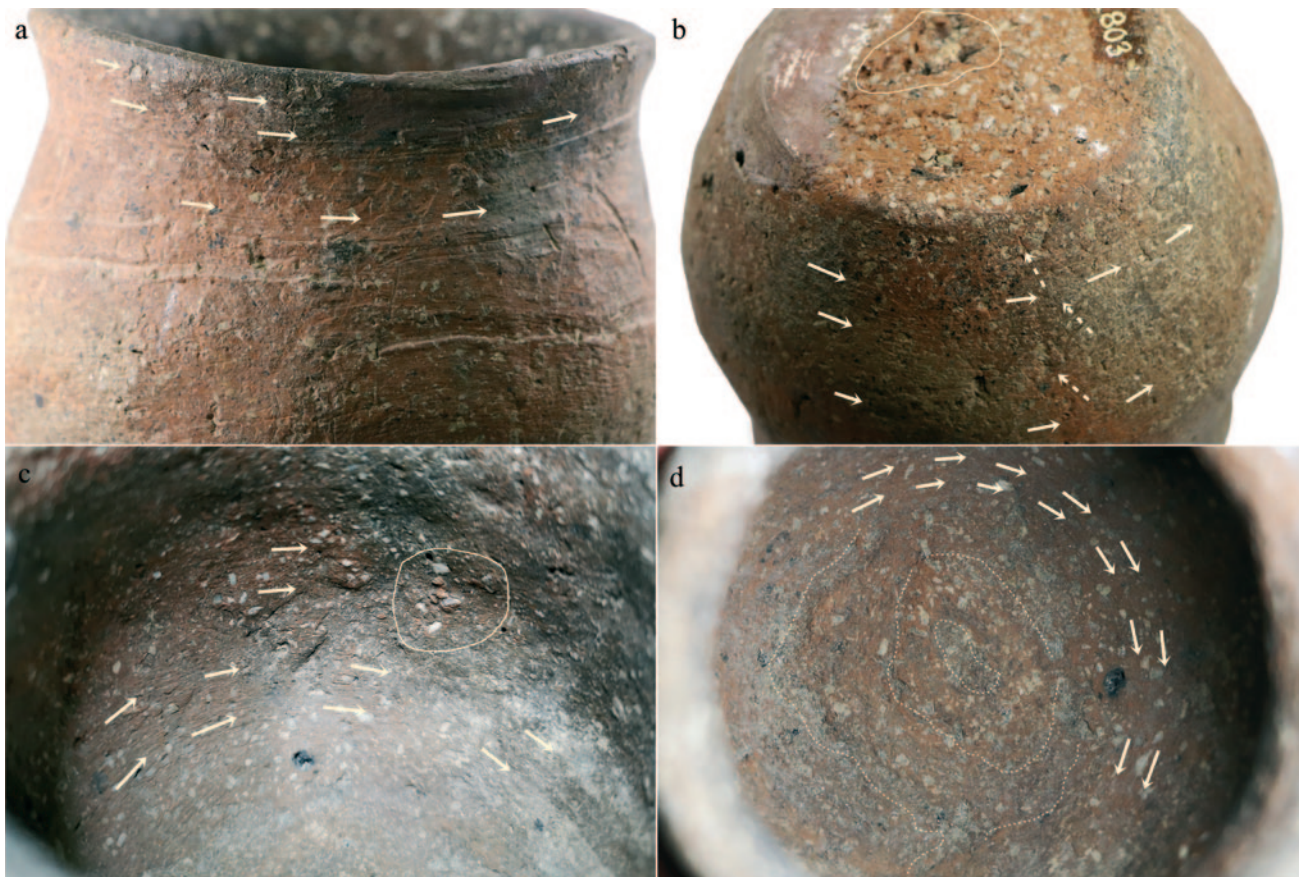
¹⁸ Za crtež v. Jelovina 1968: 29, sl. 14; Belošević 1980: T. LIV: 7.

¹⁷ For a drawing, see Jelovina 1968: 40, Fig. 23.

¹⁸ For drawings, see Jelovina 1968: 29, Fig. 14; Belošević 1980: Pl. LIV: 7.

2, no, što se tiče same kategorizacije metode s primjenom RKE, podudara se s potonjom. Riječ je o metodi 1 prema Roux i Courty (1998) u kojoj se potencijal RKE iskorištava tek za postizanje konačnih geometrijskih karakteristika posude prethodno sastavljene od glinenih valjaka, te zidova stanjenih isprekidanim pritiscima, bez rotacije. Međutim, za razliku od lanca operacija 2, rotacijskim gestama s ciljem dorade oblika posude nastojala se ujednačiti vanjšina tijela u punoj visini, ne samo gornja polovica (sl. 8: a–b). Unutarnja stijenka osrednje je oblikovana pomoću RKE, ostale su vidljive brojne kvрге, grebeni i udubljenja iz faze spajanja valjaka i stanjivanja (sl. 8: c–d). Vanjsku stijenku prekrivaju tipična ritmička udubljenja koja zidu daju blagi valoviti reljef, što se slabo nazire, kao i kod drugih lonaca s Razbojina. Taj atribut upućuje na prisutnost transformiranih valjaka u strukturi. Ukošenoj formi lonca vrlo je vjerojatno doprinio splet manje preciznog polaganja valjaka prilikom slaganja te korištenje pritisaka različite jačine u operaciji stanjivanja. Rotacijskim

characteristics of a vessel previously assembled from coils and walls thinned by intermittent pressures, without rotation. However, unlike *chaîne opératoire* 2, rotational gestures aimed at modifying the vessel's shape were employed to even out the exterior of the body along its full height, not just the upper half (Fig. 8: a–b). The inner wall was moderately regularized using RKE, with many bumps, ridges, and depressions from coil-joining and thinning remaining visible (Fig. 8: c–d). The outer wall displays typical rhythmic depressions that give it a slightly undulating relief, which is only faintly visible, as on other Razbojine vessels. This attribute indicates the presence of transformed coils in the structure. The slanted form of the pot was likely produced by a combination of less precise positioning of the coils and the use of pressures of varying strengths during the thinning operation. Rotational shaping has somewhat evened out the surface of the wall, but the voids in its structure are not filled by the movement of clay during rotation (Fig. 8: b). This also indicates a lesser overall contribution of RKE in shaping this vessel. Furthermore, accumulations of temper in



Sl. 8 – Keramički lonac iz grobne cjeline 15 – tragovi oblikovanja na ručnom kolu na vanjskom i unutarnjem zidu, nije u mjerilu (izradila: P. Jeršek)

Fig. 8 – Pot from grave 15 – wheel-coiling traces on the outer and inner wall, not to scale (made by: P. Jeršek)

oblikovanjem donekle je ujednačena površina zida, no rupice u njihovoj strukturi nisu zapunjene pomicanjem gline u rotaciji (sl. 8: b). To je ujedno indikator manjeg ukupnog doprinosa RKE u oblikovanju ove posude. Nadalje, nakupine primjese u glinenoj smjesi ukazuju na lošiju pripremu sirovina prije oblikovanja, tj. gnječenjem gline u koju su umiješane primjese nije dobivena homogena masa (sl. 8: c).¹⁹ Primjese su također korištene za posipavanje ploče kola za lakše dizanje posude (sl. 8: b). Nakon rotacijskog oblikovanja dolazi do zaglađivanja pojedinih dijelova vanjštine bez RKE te do ukrašavanja gornjeg dijela posude. Urezana je jedna krivudava crta, na mjestima valovita, a ponegdje s dodatnim paralelnim linijama. S jedne strane lonca preko njih je ucrtan motiv u obliku okrenutog slova V (sl. 8: a). S obzirom na pripremu glinene smjese, ukošenu formu, ujednačenost zidova te izvedbu ukrasa, nije pretjeran zaključak da se izrada ovog lonca može pripisati lončaru s manje iskustva i tehničkog znanja.

RASPRAVA

Obrada keramičkog materijala s groblja u Razbojinama pokazala je da generalizirani zaključak o korištenju rotacijskog kretanja samo pri oblikovanju otvora (npr. Belošević 1980: 113; Bekić 2016: 82) zapravo nije održiv. Uz uvažavanje činjenice da u postojećim monografijama nije bilo prostora za izražavanje svih kompleksnosti vezanih za oblikovanje keramike, upravo je definiranje više ili manje suptilnih razlika u tehničkoj tradiciji smjer kojim treba ići. Kao što je već ranije istaknuto, Jelovina (1968) se pri analizi keramike s Razbojina nije bitnije bavio pitanjima keramičke tehnologije. Njegov zaključak o posuđu koje se redovito oblikuje na ručnom kolu pokazao se točnim, tako da ovaj tekst s jedne strane služi i kao nadogradnja njegovog viđenja keramičke produkcije zajednice sahranjene na groblju.

Proizvode istih lončara, odnosno skupine lončara s istom obukom i pristupom oblikovanju treba, koliko je već moguće, identificirati kroz specifične lance operacija u oblikovanju, a ne putem tzv. oznaka lončara, koje su prerijetka pojava da bi se mogle smatrati is-

the clay mixture suggest inadequate preparation of the raw materials before shaping; wedging did not result in a homogeneous mass (Fig. 8: c).¹⁹ The temper was also used to dust the wheel head to facilitate lifting the vessel (Fig. 8: b). After rotational shaping, certain parts of the exterior were smoothed without RKE, and the upper part of the vessel was decorated. A single sinuous line was incised, which is wavy in some places and accompanied by additional parallel lines in others. On one side of the pot, a motif in the shape of an inverted letter V was drawn over these lines (Fig. 8: a). Considering the preparation of the clay paste, the slanted form, the uniformity of the walls, and the execution of the decoration, it is reasonable to conclude that the making of this pot can be attributed to a potter with less experience and technical knowledge.

DISCUSSION

The analysis of ceramic material from the Razbojine cemetery has revealed that the generalized conclusion regarding the use of rotational movement solely for shaping vessel openings is not actually valid (e.g., Belošević 1980: 113; Bekić 2016: 82). While it is understandable that existing monographs may not have the space to present all the complexities associated with ceramic production, pursuing a more nuanced understanding of technical traditions is warranted. As previously noted, Jelovina (1968) did not address technical issues in his analysis of the ceramics from Razbojine. However, his conclusion that the vessels were regularly shaped on a hand-wheel has proven correct. Therefore, this text serves as an extension of his analysis of the ceramic production of the community buried in the cemetery.

The products of the same potters – or groups of potters sharing the same training and approaches to shaping – should, as far as possible, be identified through specific *chaînes opératoires* in shaping, rather than relying on the so-called “potters’ marks” which are too rare to be considered exclusively indicative of individual potters. It is important to note that no consistent patterns were observed between the occurrence of “potters’ marks” and specific *chaînes opératoires*. The described chains of operations demonstrate that potters often approach many shaping operations in similar ways. However, they

19 Za više informacija o miješanju sastojaka lončarske smjese v. Rye 1981: 18–20; Rice 2005: 119; Roux 2019: 39.

19 For more information on mixing clay paste ingredients, see Rye 1981: 18–20; Rice 2005: 119; Roux 2019: 39.

ključivo time. Pritom je važno spomenuti da nisu uočene zakonitosti između pojavnosti „oznaka lončara“ i pojedinih *chaîne opératoire*-a. Opisani lanci operacija pokazali su da lončari mnogim operacijama u oblikovanju pristupaju na jednak način, dok s druge strane ipak u proces unose neke geste prema kojima se mogu prepoznati možda ne pojedinačni lončari, ali svakako lončari s istom obukom. Nadalje, metode 1 i 2 prema Roux i Courty (1998) nisu metode u kojima se u potpunosti iskorištava rotacijski potencijal kola te se smatraju vezanijima uz tehniku gradnje valjcima. Iz tog razloga bliskije su majstorima koji tek počinju ovladavati tehnikom rotacijskog oblikovanja. Ako uspoređujemo metode 1 (ovdje u lancima operacija 2 i 3) i 2 (u lancu operacija 1), načelno nema značajnijih razlika u sposobnostima lončara koji ih prakticiraju, posebno kod manjeg posuđa, no odabir jedne naspram druge ipak je povezan s postupnim napretkom u korištenju ručnog kola i usavršavanjem lončara. Vidljive razlike pak postoje među gotovim keramičkim proizvodima, gdje se skupina lonaca oblikovana metodom 2, odnosno prema *chaîne opératoire* 1, ističe svojom kvalitetom, skladnom formom i tek manjim nesavršenostima. Potražnja za svakodnevnim kuhinjskim posuđem ostavljala je prostora za postojanje lončara nejednakog stupnja uvježbanosti, pogotovo ako su njihovi proizvodi zadovoljavali svoju osnovnu funkciju. Nadalje, korištenje rotacijskog kretanja pri stanjivanju zidova kod metode 2 odražava se i na brzinu oblikovanja. Ušteda vremena nije velika, ali postoji. Eksperimentalna istraživanja ukazuju na 10 minuta kraće oblikovanje po posudi (Roux, Courty 1998: 750, tab. 2), što je potvrđeno kroz vlastito iskustvo rada na ručnom kolu.

Na temelju dostupnog uzorka s ovog groblja (lokalitet nije u cijelosti istražen), kao dominantni način oblikovanja pokazao se lanac operacija 2 (metoda 1). Premda je RKE redovito korištena tek u kasnijim fazama oblikovanja (rjeđe za stanjivanje, češće za finaliziranje oblika), treba reći da samo ručno kolo predstavlja ključnu stavku u cijelom procesu kao rotacijski instrument koji lončaru olakšava pristup svim dijelovima posude kroz diskontinuiranu vrtnju manje brzine. U tom smislu, doprinos ručnog kola u oblikovanju ovog posuđa veći je od doprinosa RKE,

also introduce certain gestures into the process that, while not necessarily identifying individual potters, can distinguish those with shared training and techniques. Furthermore, methods 1 and 2, as defined by Roux and Courty (1998), do not fully exploit the rotational potential of the wheel and are considered more closely related to the coiling technique. For this reason, they are more typical of craftsmen who are just beginning to master the wheel-coiling technique. Comparing method 1 (here represented in *chaînes opératoires* 2 and 3) and method 2 (in *chaîne opératoire* 1), there are generally no significant differences in the abilities of the potters who practice them, especially with smaller vessels. However, the choice of one method over the other is still related to gradual progress in the use of the hand-wheel and the improvement of the potter's skill. Visible differences exist among the finished ceramic products: the group of pots fashioned by method 2, or according to *chaîne opératoire* 1, stands out for its quality, symmetrical form, and only minor imperfections. The demand for everyday kitchenware left room for potters with varying levels of training, especially if their products satisfied basic functional requirements. Furthermore, the use of rotational movement in thinning the walls in method 2 is also reflected in the speed of shaping. While time savings are not substantial, they do exist. Experimental studies have shown that shaping time per vessel is reduced by 10 minutes (Roux, Courty 1998: 750, Tab. 2), which has been confirmed by my own experience working on the hand-wheel.

Based on the available sample from this cemetery (as the site has not been fully excavated), the dominant shaping method was shown to be operational chain 2 (method 1). Although RKE was regularly used only in the later stages of shaping (less often for thinning, more often for shape modification), it should be noted that the hand-wheel itself represents a key factor in the entire process, serving as a rotary instrument that facilitates the potter's access to all parts of the vessel through discontinuous rotation at a lower speed. In this sense, the contribution of the hand-wheel to shaping the vessels is greater than that of RKE, and these two contributions should be clearly distinguished.²⁰ In addition, shaping with methods 1 and 2 is consistent with the results of

²⁰ Therefore, it would be more accurate to state that the vessels were partially finished using rotational kinetic energy (RKE) or by continuous wheel rotation, rather than to say they were "partially finished on a hand-wheel" while also being "made on a slow-rotating wheel" (Bekić 2016: 82).

a ta dva doprinosa treba jasno razlikovati.²⁰ Oblikovanje metodama 1 i 2 u skladu je s rezultatima testa standardizacije keramike s Razbojina. Oni upućuju na nespecijaliziranu ruralnu proizvodnju vezanu uz domaćinstva, orijentiranu na zadovoljavanje lokalnih potreba, s nekoliko lončara u naselju (Jeršek 2026, in press). Ipak, nije uočena povezanost između tipologije i pojedinih sekvenci operacija.

Trenutno nije moguće raditi usporedbe s keramičkim priložima s ostalih istovremenih groblja u regiji (npr. Kašić – Maklinovo brdo, Nin – Ždrijac, Nin – Materiza, Nin – Banovac, tumuli kod Krneze i Podvršja) zato što prva sistematično analizirana keramička građa dolazi upravo s Razbojina u Kašiću. U međuvremenu, moguća je jedino usporedba s ranosrednjovjekovnim keramičkim materijalom s udaljenijih lokaliteta dublje u unutrašnjosti – kontinentalne Hrvatske i zapadne Mađarske. T. Sekelj Ivančan i A. Kudelić (2015) daju kraći osvrt na keramičku tehnologiju temeljem analize nalaza s lokaliteta Torčec – Prečno Pole I (Sekelj Ivančan, Tkalčec, Šiljeg 2003; Sekelj Ivančan 2010: 26–49) i Virje – Volarski Breg/Sušine (Sekelj Ivančan 2011: 18–21) u okolici Koprivnice. Keramički nalazi dolaze iz naseobinskog arheološkog konteksta. Ustanovile su da se rotacijski potencijal ručnog kola iskorištava tek u operaciji oblikovanja otvora i, ponekad, unutrašnjosti dna. Ovom sažetom opisu načina rada bio bi najbližiji lanac operacija 2 s Razbojina. Tehnološkim tragovima na keramici iz arheoloških istraživanja memorijalnog parka na lokalitetu Zalavár-Vársziget, datiranim u drugu polovicu 9. stoljeća, bavila se Z. Mersdorf (2007). Mersdorf također raspolaže keramičkim ulomcima. Dijagnostički atributi kojima daje najveću pozornost su karakteristični prijelomi, vodoravni uzorci loma, otisci osovine, tragovi spojeva među valjcima, tragovi spajanja otvora s ostatkom tijela, tragovi stanjivanja i zaglađivanja te tragovi rotacijskog oblikovanja. Razlikuje posude kod kojih kontinuirana vrtnja kola ima veći i manji utjecaj u oblikovanju. Ipak, fokus je na davanju pregleda svih uočenih tragova na keramici, ne na kategorizaciji materijala prema istim obilježjima. Na temelju dostupnih informacija, s opre-

the standardization test of ceramics from Razbojine. These results indicate an unspecialized, household-based rural production aimed at meeting local needs, with several potters in the settlement (Jeršek 2026, in press). However, no connection was observed between the typology and individual sequences of operations.

It is currently not possible to make comparisons with ceramic grave goods from other contemporary cemeteries in the region (e.g., Kašić – Maklinovo brdo, Nin – Ždrijac, Nin – Materiza, Nin – Banovac, tumuli near Krneza and Podvršje), as the first systematically analyzed ceramic material comes from Razbojine in Kašić. At present, only comparisons with early medieval ceramic material from more distant sites further inland – specifically continental Croatia and western Hungary – are possible. T. Sekelj Ivančan and A. Kudelić (2015) provided a brief overview of ceramic technology based on findings from the sites of Torčec – Prečno Pole I (Sekelj Ivančan, Tkalčec, Šiljeg 2003; Sekelj Ivančan 2010: 26–49) and Virje – Volarski Breg/Sušine (Sekelj Ivančan 2011: 18–21) near Koprivnica. The ceramic material comes from a settlement archaeological context. They found that the rotational potential of the hand-wheel was used only in shaping the opening and, occasionally, the interior of the base. The operational chain 2 from Razbojine most closely corresponds to this concise description of the shaping method. Technological traces on ceramics from archaeological research at the memorial park at the Zalavár-Vársziget site, dated to the second half of the 9th century, were studied by Z. Mersdorf (2007), who also examined ceramic sherds. The diagnostic attributes she focuses on include characteristic profiles of breaks, horizontal fracture patterns, axle impressions, traces of joints between coils, traces of joining the opening to the rest of the body, traces of thinning and smoothing, and evidence of rotational shaping. She distinguishes between vessels in which the continuous rotation of the wheel had a greater or lesser influence on shaping. However, her focus is on providing an overview of all observed traces on the ceramics rather than categorizing the materials according to the same characteristics. Based on the available information, one could cautiously assume the presence of methods 1 and 2 as described by Roux and Courty (1998). A more detailed comparison with the ceramics from Razbojine is not feasible due to significant differences in methodology. Mersdorf also links ceramic production to “household industry” and identifies criteria for identifying individual

20 Stoga bi bilo pravilnije reći da su posude djelomično dorađene pomoću RKE ili kontinuiranom vrtnjom kola, a ne da su „djelomično dorađene na ručnom kolu“, a ujedno „izrađene na sporovrtećem kolu“ (Bekić 2016: 82).

zom bi se stoga mogla pretpostaviti prisutnost metoda 1 i 2 prema Roux i Courty (1998). Detaljnija usporedba s Razbojinama zapravo nije moguća zbog prevelikih razlika u metodologiji. Keramičku produkciju također veže uz „kućnu industriju“, a kao kriterije za identifikaciju pojedinačnih lončara izdvaja oblik posude, otiske na dnu te analizu cjelokupnog procesa oblikovanja. Materijal kojeg analizira ne dopušta takve zaključke.

ZAKLJUČAK

Analizom tehnoloških aspekata keramičke građe s groblja u Razbojinama kod Kašića napravljen je odmak, u metodološkom i interpretativnom smislu, od još uvijek prevladavajućeg morfološko-stilskog pristupa u obradi ranosrednjovjekovnog keramičkog materijala, posebno iz ranosrednjovjekovne Hrvatske. Glavni doprinos leži u primjeni koncepta *chaîne opératoire* za preciznije definiranje procesa oblikovanja. Pokazalo se da na naočigled tehnički homogenom keramičkom materijalu ipak postoji određena tehnološka varijabilnost, ne u kontekstu korištene tehnike oblikovanja, već po pitanju metode i specifičnih slijedova operacija. Dobiven je zanimljiv uvid u lokalnu lončarsku praksu u kojoj postoje tri srodna, ali prema stupnju i načinu uporabe rotacijskih mogućnosti ručnog kola različita lanca operacija. Kako je lanac operacija 3 zastupljen samo na jednome loncu, ostali lanci operacija (1–2) mogli bi se dovesti u vezu s dvije skupine lončara povezanih procesom prijenosa tehničkog znanja. Naime, osnove za prepoznavanje pojedinačnih lončara zapravo nema. Po pitanju kvalitete gotovih proizvoda, kao vještija skupina izdvaja se ona koja je oblikovala posude metodom 2 prema Roux i Courty, odnosno ona koja slijedi lanac operacija 1. Dublje razumijevanje tehničke tradicije i lončarske produkcije na teritoriju ranosrednjovjekovne Hrvatske zadatak je čijem rješavanju treba stremiti u narednom periodu, a makroskopski pristup analizi prema mogućnostima nastojati proširiti drugim, arheometrijskim metodama.

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potters – such as vessel shape, impressions on the base, and an analysis of the entire shaping process. However, the material she analyzed did not allow for such definitive conclusions.

CONCLUSION

The analysis of the technological aspects of the ceramic material from the cemetery of Razbojine near Kašić represents a methodological and interpretative departure from the still predominant morphological-stylistic approach to the processing of early medieval ceramic material, especially in early medieval Croatia. The main contribution of this research lies in the application of the concept of the *chaîne opératoire* to define the shaping process more precisely. It has been shown that within an apparently technically homogeneous ceramic assemblage, there is a certain degree of technological variability – not in terms of the shaping technique used, but in the method and the specific sequences of operations. This study has provided insight into local pottery practices, revealing three interlinked chains of operations that differ in the degree and manner of utilizing the hand-wheel's rotational capabilities. Since operational chain 3 is represented by only one pot, the other operational chains (1–2) could be linked to two groups of potters connected by the process of transferring technical knowledge. It is important to note that there is no basis for identifying individual potters. Regarding the quality of the finished products, the group that formed vessels according to Roux and Courty's method 2, i.e., *chaîne opératoire* 1 appears to be the more experienced. The development of a deeper understanding of technical traditions and ceramic production in early medieval Croatia remains a task for future research. To this end, the macroscopic approach should be supplemented by other archaeometric methods where possible.

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T. 1 – Posuđe iz grobnih cjelina 5, 6, 13, 15, 16, 17 i 19 (izradila: P. Jeršek)
Pl. 1 – Vessels from graves 5, 6, 13, 15, 16, 17, and 19 (made by: P. Jeršek)



T. 2 – Posuđe iz grobnih cjelina 27, 29, 30, 32, 33, 36 te slučajno otkrivenog groba (*) (izradila: P. Jeršek)
 Pl. 2 – Vessels from graves 27, 29, 30, 32, 33, 36, and the accidentally discovered grave (*) (made by: P. Jeršek)

