Original Article

# Robot-assisted retroperitoneal lymph node dissection: Feasibility and outcome in postchemotherapy residual mass in testicular cancer

**Amitabh Singh*, Smaranjit Chatterjee, Prashant Bansal, Abhishek Bansal, Sudhir Rawal**

Department of Uro-oncology, Rajiv Gandhi Cancer Institute and Research Centre, New Delhi, India

*E-mail: amitabhsingh27@gmail.com

## ABSTRACT

**Introduction:** We aimed to evaluate the surgical feasibility, complication, and oncological outcome of robot-assisted retroperitoneal lymph node dissection (RA-RPLND) in patients of testicular tumor with postchemotherapy residual retroperitoneal mass.

**Methods:** A total of 13 patients underwent RA-RPLND between January 2012 and September 2016 at our institute. A study was started on December 2015, so data were collected retrospectively and prospectively regarding patient demography, tumor characteristics, surgical, pathological outcome, and oncological outcome.

**Results:** RA-RPLND was successfully completed in all the 13 patients. Lateral approach was used in initial 12 patients with unilateral dissection in 11 patients and bilateral dissection after in 1 patient after repositioning in bilateral position. Supine robotic approach used in 1 patient. Median operative time was 200 min, median estimated blood loss was 120 ml, and median length of hospital stay was 4 days. The median yield of lymph node was 20. Three patients had positive lymph nodes, all had teratoma germ cell tumor. Ten patients had only necrosis in lymph nodes. After median follow-up 23 months (range 3-58 months), no systemic or retroperitoneal recurrence was found. Four patients developed chyle leak. One patient was managed conservatively with diet modification, one with intranodal lipiodol lymphangiography and two patients were managed surgically.

**Conclusion:** RA-RPLND is safe and feasible for postchemotherapy residual mass with accepted compilation rate, but larger studies are required to establish its diagnostic and therapeutic utility along with safety of the procedure.

## INTRODUCTION

Retroperitoneal lymph node dissection (RPLND) is a well-established treatment for postchemotherapy residual mass in nonseminomatous germ cell tumor (NSGCT). Although open RPLND is the gold standard procedure, it has high postoperative morbidity and poor cosmesis due to a long midline abdominal incision. To reduce postoperative morbidity and hasten recovery, Rukstalis and Chodak[1] described laparoscopic-RPLND (L-RPLND). The proposed advantages of L-RPLND are good cosmesis, shorter hospital stay, less postoperative pain, and reduced complication rate. L-RPLND has been used in postchemotherapy residual mass cases, but it has a steep learning curve and difficulty in dissection at retroaortic and retrocaval space.[2]

Robotics has been able to combine open surgical skills with laparoscopy approach and allows performance of complex procedures such as radical prostatectomy, radical cystectomy, radical nephrectomy with vena caval thrombectomy, and RPLND with robotics.[3-5] There are only a few case series of robot-assisted RPLND (RA-RPLND) which have reported mainly patients with clinical stage (CS) I NSGCT, low-volume CS II disease. Literature about experience of

| Access this article online | |
|---|---|
| Quick Response Code: | Website: www.indianjurol.com |
| | DOI: 10.4103/iju.IJU_8_17 |



**Received:** 11.01.2017, **Accepted:** 25.04.2017

**Financial support and sponsorship:** Nil

**Conflicts of interest:** There are no conflicts of interest.

RA-RPLND in residual disease after chemotherapy is still very limited. We describe our experience of RA-RPLND in initial case series, largest till date, of 13 patients of postchemotherapy residual mass.

## PATIENTS AND METHODS

In this institutional review board approved study beginning December 2015, we collected retrospective and prospective data of all patients those who underwent RA-RPLND between January 2012 and September 2016. All patients were operated by a single surgeon who had extensive experience in robotic surgery as well as open surgery. All patients had diagnosis of NSGCT of testis and received either 3 or 4 cycles of bleomycin, etoposide, and cisplatin with or without salvage chemotherapy. All patients with a postchemotherapy residual mass and normal tumor marker and minimal retroperitoneal disease were offered RA-RPLND. Single tumor at landing zone up to 6 cm or multiple tumors over both the inferior vena cava and the aorta <5 cm, without involvement of adjacent organ, were considered as minimal disease. All 13 patients underwent nerve-sparing RA-RPLND. Eleven patients underwent modified template RPLND and two patients underwent bilateral full dissection. RA-RPLND was performed using da Vinci Si$^{HD}$ in all the patients.

### *Technique*

#### *Lateral approach*

Patients were placed in 90° lateral position with pressure points padded. Veress needle was used to create pneumoperitoneum by closed technique. Right and left lower palmer points were used for creating pneumoperitoneum. Incision for 12 mm camera port was placed 3 cm above and lateral to umbilicus in pararectus line. Two 8 mm robotic ports were placed in same pararectus line, one below subcostal margin and another 8–10 cm below camera port. Another 8 mm robotic port for the fourth arm was placed 4 cm above and medial to anterior superior iliac spine. A 12 mm assisted port was placed at umbilicus. 5 mm port for liver retraction was placed in case of right-sided RPLND between xiphoid and umbilicus in midline [Figure 1]. The robot was then docked from behind the patient after breaking the bridge of table to increase the space between rib and anterior superior iliac spine.

For right-sided robot-assisted retroperitoneal lymph node dissection, we began by incising the line of Toldt and reflecting ascending colon medially along with duodenum. Mobilization of colonic mesentery was done up to aorta. After identifying right renal veins, right renal artery, and right ureter, dissection was started from cephalad to caudal direction. The paracaval lymph nodes were removed below right renal hilum and medial to right ureter by split and roll technique described by Donohue[6] up to bifurcation of the right common iliac artery. Right gonadal vessel was ligated and divided at the junction with inferior vena cava. Retrocaval space was dissected to remove all lymph node with ligation of lumbar vessel. Interaortocaval lymph nodes were dissected in cephalic to caudal direction starting from level of renal hilum [Figure 2]. Dissection was carried up to inferior mesentery artery level with preservation of nerve fibers. Retroaortic and para-aortic lymph nodes were also dissected in cephalic to caudal direction. In case of right testicular tumor, lateral margin of dissection was up to left ureter, whereas in case of left-sided tumor margin, it was lateral to inferior vena cava. The entire procedure was completed in a single docking position. The specimen was removed by extending the umbilical port.

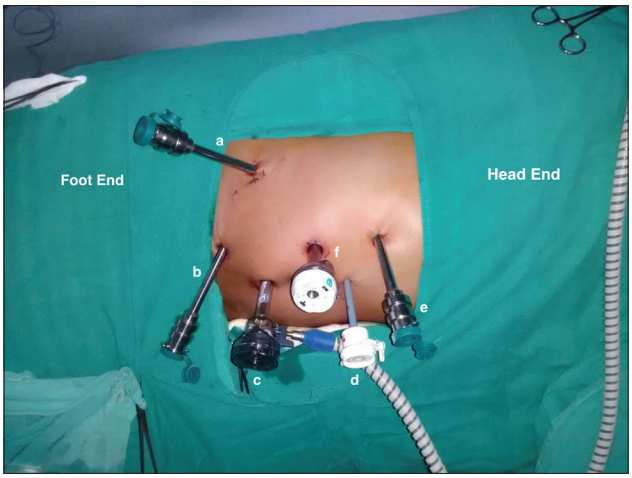


**Figure 1:** Port placement for robot-assisted retroperitoneal lymph node dissection in left lateral position. (a) 8 mm port for Prograsp forceps in the right iliac fossa; (b) 8 mm port for fenestrated bipolar in lower abdomen at pararectal line; (c) 12 mm port for assistance at periumbilical location; (d) 5 mm port for liver retraction in midline; (e) 8 mm port for monopolar scissor; (f) 12 mm port for camera

### *Supine approach*

We performed RPLND using supine approach as described by Stepanian *et al*. in one patient.[7] In this approach, the patient was placed supine with arms placed by the side of the patient. Pneumoperitoneum was created using Veress needle. 12 mm camera port was placed 4 cm below umbilicus in midline. In left lower quadrant, we placed two 8 mm robotic trocar. In the right lower quadrant, one 8 mm robotic trocar and one 12 mm assistant port were placed [Figure 3]. After placing trocars, the patient was placed in Trendelenburg position up to 20°–30° so that the small bowel could fall towards the diaphragm. The robot was docked from the head end of the patient. With this approach, we were able to dissect the full template in a single docking position. We used the 30° down angle lens with monopolar scissor and Prograsp forceps in the left quadrant and bipolar forceps in the right lower quadrant.

Technique of RPLND in supine approach was same as in open RPLND. Incision was given on the peritoneum medial to the cecum and extended up to ligament of Treitz.

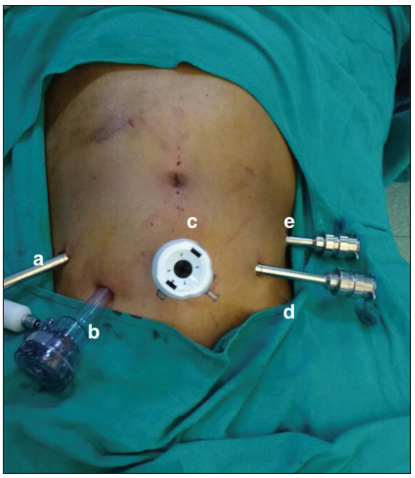


**Figure 2:** Port placement for robot-assisted retroperitoneal lymph node dissection in supine position. (a) 8 mm port for fenestrated bipolar in the right iliac fossa; (b) 12 mm port for assistance; (c) 12 mm port for camera in midline; (d) 8 mm port for monopolar scissor; (e) 8 mm port for Prograsp forceps

Small bowel and cecum was mobilized cephalad to expose retroperitoneum for full bilateral dissection.

We used laparoscopic Hem-o-lok clip 5 mm for lumbar vessel and did not experience any difficulty in hemostasis. We used prolene 5-0 for any adventitial tear of great vessel. At the end of procedure, we used hemostatic agents on the bed of the great vessels for hemostasis. A drain was placed in all patients and was removed when the output was <50 ml. If drain output color was white, we checked for chylomicrons and triglycerides in drain fluid to rule out chyle leak.

### *Postoperative care and follow-up*

Patients were allowed orally in postoperative period depending on bowel movement recovery. Follow-up studies were done every 3 monthly for 2 years, 6 monthly for next 2 years, and then yearly. Follow-up investigations included testicular tumor marker with abdominal ultrasound and chest X-ray every 3 monthly. Contrast-enhanced computed tomography was done every 6 monthly or whenever there was increase in tumor markers during the follow-up.

## RESULTS

Between January 2012 and September 2016, we included 13 patients who underwent RA-RPLND in the study while another 44 patients underwent open RPLND during the same period. Preoperative patient profile is given in Table 1. The median age was 26 years (21–37 years) and body mass index was 21.32 (17.35–24.38 kg/m$^2$). Nine patients had mixed germ cell tumors, 3 patients had embryonal cell carcinoma and one had yolk sac tumor. Seven patients had IIA stage, five patients had IIB stage, and one patient had IIC stage after chemotherapy. Largest size of postchemotherapy mass was 6 cm. Twelve patients were operated in lateral position and one patient in supine position. In 11 patients,

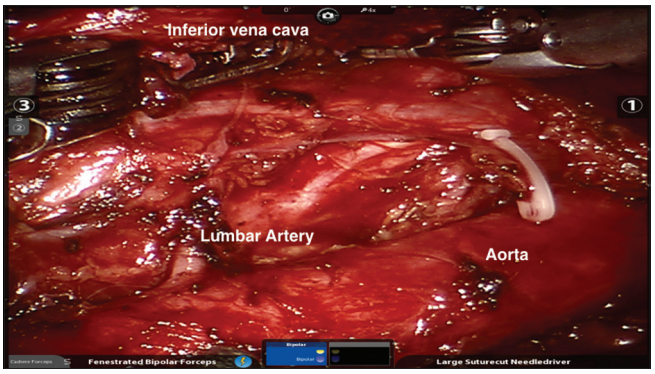


**Figure 3:** Intra-operative picture of RA-RPLND showing Aorta, lumbar Artery, and IVC

**Table 1: Clinical and pathological characteristics of patients**

| Parameters | Number |
|---|---|
| Total number of patients | 13 |
| Pathology | |
| Yolk sac | 1 |
| Embryonal cell carcinoma | 3 |
| Embryonal + yolk sac | 2 |
| Embryonal + seminoma | 2 |
| Embryonal + teratoma | 1 |
| Embryonal + yolk sac + teratoma | 1 |
| Embryonal + yolk sac + choriocarcinoma + teratoma | 2 |
| Mixed germ cell in retroperitoneum with burn out testicular primary | 1 |
| Prechemotherapy clinical stage | |
| IIB | 3 |
| IIIA | 5 |
| IIIB | 5 |
| Chemotherapy | |
| 3 BEP | 5 |
| 4 BEP | 6 |
| 4 BEP + 3 TIP | 1 |
| 3 BEP + 3 VIP | 1 |
| Postchemotherapy clinical stage | |
| IIA | 7 |
| IIB | 5 |
| IIC | 1 |
| Template | |
| Right | 8 |
| Left | 3 |
| Bilateral | 2 |
| Position of patient during RA-RPLND | |
| Lateral | 12 |
| Supine | 1 |

Clinical stage was based on TNM classification (2009). B=Bleomycin, E=Etoposide, P=Cisplatin, T=Paclitaxel, I=Ifosfamide, V=Vinblastine, RA-RPLND=Robot-assisted retroperitoneal lymph node dissection, TNM=Tumor, node, metastasis

modified template dissection was done, and in 2 patients, full bilateral dissection was done. Clinical and pathological characteristics of patients have been given in Table 1.

RA-RPLND was completed in all 13 patients with no conversion to open surgery. The median operative time was 200 min and estimated median blood loss was 120 ml. The median length of hospital stay was 4 days (3–5 days). The median lymph node yield was 20, and in 10 patients,

lymph nodes were negative for disease. In 3 patients, lymph nodes were positive for teratoma. No disease recurrence was reported after median follow-up of 23 months (range 3–58 months).

One patient had intraoperative aortic injury which was managed by suturing the tear. Four patients developed chyle leak in postoperative period. One patient was managed conservatively with low-fat diet, the other one underwent intranodal lipiodol lymphangiography, and the remaining two patients were managed by laparotomy and suturing of lymphatics. Five patients had paralytic ileus in postoperative period.

## DISCUSSION

RPLND is a well-established treatment for postchemotherapy residual mass in testicular tumor. Steyerberg *et al*.[8] reported the presence of persistent germ cell tumor element in more than 50% cases. On average, necrosis, teratoma, and viable malignancy present in 45%, 42%, 13% of all cases, respectively.[8] The 5-year survival after complete resection of viable malignancy with or without postoperative chemotherapy ranges from 45% to 77%, whereas if not treated only 25%–35% of patient will achieve durable response with second-line chemotherapy. Unresected teratoma may cause growing teratoma syndrome, malignant transformation, and late relapse, all of which may lead to lethal consequences. Teratoma is chemoresistant, so it requires combination of chemotherapy and surgery for complete treatment.

Laparoscopic-RPLND (L-RPLND) was first introduced in 1992.[1] In comparison to the open approach, L-RPLND resulted in decreased blood loss, shorter convalescence, and better cosmesis. Gerber *et al*. reported L-RPLND as feasible and safe technique.[9]

Initially during L-RPLND, retrocaval and retroaortic spaces were avoided during dissection and every patient used to get adjuvant chemotherapy routinely. Hence, there was concern about curative intent of L-RPLND and it was only considered as a diagnostic procedure.[10] A meta-analysis by Rassweiler *et al*. reported similar staging accuracy and long-term outcome in L-RPLND with decreased complication.[11]

Davol *et al*. reported first RA-RPLND in 2006[12] and subsequently many other investigators reported small case series of RA-RPLND.[13-15] However, most investigators have reported their experience of RA-RPLND in CS IA, IB, IIA, IIB, IIC. There are only a few studies, which reported experience of RA-RPLND for postchemotherapy residual mass.[7,16-18] Although these are retrospective studies and had small number of patients, they reported acceptable surgical and oncologic outcome. Our study of 13 patients is the largest one to best of our knowledge with retrospective and prospective follow-up.

A comparison of various parameters between our study and previous studies has been given in Table 2. In our case series of 13 patients, median age of patients was 26 years and median BMI was 21.32, which is less than from patient cohort of other study. Similarly, median operative time and median estimated blood loss was also less in our study. This could be attributed to lower BMI, younger age group, and in 11 patients, RA-RPLND done in unilateral position without repositioning.

In two patients, full bilateral dissection done because both patients had bilateral disease. It was difficult to reach the opposite template in lateral position and therefore in one patient, bilateral dissection was performed in both lateral positions after repositioning the patient while in another patient, supine position with single docking of robot was used. RA-RPLND in supine position as described

**Table 2: Comparison of studies**

| Charateristics | Our study | Kamel (2016) | Stepanian (2016) | Cheney (2015) |
|---|---|---|---|---|
| Postchemotherapy cases/total cases | 13/13 | 12/12 | 4/20 | 8/18 |
| Age (year)[a] | 26 | 39 | 36 | 38 |
| BMI (kg/m$^2$)[a] | 21.32 | Not mentioned | 25.7 | 29.25 |
| OT (min)[a] | 200 | 298.5 | 317.5 | 358 |
| EBL (ml)[a] | 120 | 300 | 150 | 150 |
| LOS (day)[a] | 4 | 3.6 | 1.5 | 2.5 |
| Transfusion cases | 0 | 2 | 0 | 1 |
| Conversion cases | 0 | 2 | 0 | 2 |
| Lymph node yield | 20 | 12[c] | 21 | 20.5 |
| Positive nodes | 3/13 | 6/12 | 2/4 | 4/8 |
| Follow-up (months) | 23 | 30 | 40 | 2.5 |
| Recurrence | 0 | 0 | 0 | 0 |
| Complication (Clavien I–II) | 2 | 2 | 0 | 3 |
| Complication (Clavien III–IV) | 2 | 1 | 1 | 0 |
| Retrograde ejaculation | 2/13 | 2/10[d] | 2/20 | 1/11[b] |

[a]Median value of parameter taken from study, [b]Nerve preservation done in only 11 cases, [c]Mean value of lymph node yield, [d]Out of 12 patients, only 10 patients had complete follow-up. BMI=Body mass index, OT=Operating time, EBL=Estimated blood loss, LOS=Length of hospital stay

by Stepanian *et al*.[7] has several advantages over the lateral approach. Full bilateral dissection can be completed in single position with good exposure of retroperitoneum except resection of ipsilateral spermatic cord with the use of da Vinci Si$^{HD}$. Operating time can also be saved as there is no need to reposition the patient.

In our case series, lymph node yield is comparable to other studies. Two patients had mature teratoma; one patient had teratoma with somatic sarcomatous transformation. Ten (76.9%) patients had necrosis which is more than 45% as reported by Steyerberg *et al*.[8]

Although the modified template is widely practiced, it is controversial in a postchemotherapy setting and a full bilateral resection is considered to be the standard procedure.[19-21] In another study, 7%–32% extratemplate retroperitoneal disease was reported, depending on the boundaries of the modified template used.[21] Beck *et al*. in their study of 100 patients, found recurrence in 4 patients only which was outfield recurrence.[22] Heidenreich *et al*. found only one infield relapse in modified template whereas 7 outfield relapse in full bilateral template.[23] Hence, while it is still a controversial topic, if lymph node mass is found in landing site, limited dissection is justified.

In our study, 11 out of 13 patients underwent modified template dissection but we did not find biochemical and radiological recurrence of disease in any patient in median follow-up of 23 months. Nerve preservation was done in all 13 cases but 2 patients had retrograde ejaculation.

Incidence of chylous ascites in L-RPLND for CS I NSGCT is 6.6%.[24] Evans *et al*. found increasing cycles of preoperative chemotherapy (odds ratio 1.24) and intraoperative blood loss (odds ratio 1.33) were predictive of chylous ascites on univariate and multivariate logistic regression analyses.[25] Although their study included only patients of open RPLND, an overall incidence of chylous ascites was 7%. In our study, 4 (30.7%) patients developed chyle leak. The higher incidence in our series could be because of less use of suture and clip during dissection and division of lymphatics and difficulty in identification of lymphatic in postchemotherapy setting. Higher incidence in comparison to postchemotherapy series could also be because we did not keep patients on low-fat diet in immediate postoperative period. Chyle leak can be conservatively managed with a low-fat, medium chain triglyceride diet, parenteral nutrition. In failure of conservative treatment, radiological intervention such as lymphangiography and embolization, and peritoneovenous shunt, lymphatic ligation can be used.[26,27] In our study, two cases of chylous ascites were managed surgically when all conservative measures failed and patient's nutrition deteriorated. In both cases, lymphangiography was not done because of lack of facility. Preoperatively, we administered high-fat diet to make easy intraoperative identification of leaking lymphatics. One patient was managed conservatively and another patient was managed by intranodal lipiodol lymphangiography [Figure 4].

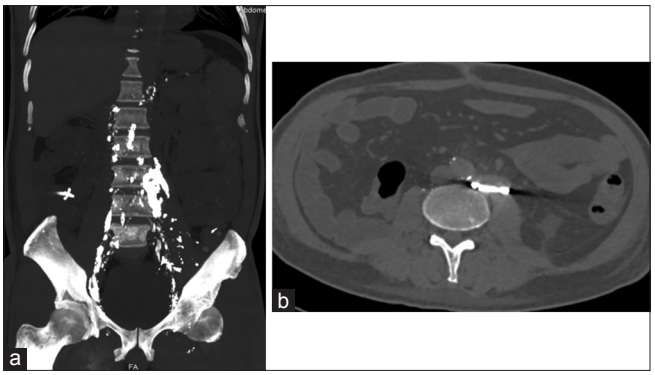


**Figure 4:** (a) Computed tomography abdomen multiplanar reformat demonstrating dense pooling of lipiodol at the site of chyle leak; (b) Axial section showing chyle leak in the left para-aortic region

To the best of our knowledge, this is the largest series of RA-RPLND in postchemotherapy patients till date. Our study has included only those patients, who underwent RA-RPLND for postchemotherapy residual mass, whereas other studies included patients of CS I, II, and postchemotherapy residual mass. We reported retrospective as well as prospective follow-up of patients, whereas other studies are completely retrospective in nature.

Our study has certain limitations too like it is not prospective completely, small cohort of patients, and short oncological follow-up. Hence, we need larger study group with longer follow-up to derive any conclusion.

## CONCLUSIONS

As RA-RPLND combines open technique to laparoscopic technique efficiently, it looks like a promising treatment alternative to open RPLND. RA-RPLND has also shown almost similar surgical, oncological outcome and lymph node yield. In future, RA-RPLND will be used frequently for the treatment of postchemotherapy patients.

## REFERENCES

1. Rukstalis DB, Chodak GW. Laparoscopic retroperitoneal lymph node dissection in a patient with stage 1 testicular carcinoma. J Urol 1992;148:1907-9.
2. Steiner H, Leonhartsberger N, Stoehr B, Peschel R, Pichler R. Postchemotherapy laparoscopic retroperitoneal lymph node dissection for low-volume, stage II, nonseminomatous germ cell tumor: First 100 patients. Eur Urol 2013;63:1013-7.
3. Patel M, Porter J. Robotic retroperitoneal partial nephrectomy. World J Urol 2013;31:1377-82.
4. Abaza R. Robotic surgery and minimally invasive management of renal tumors with vena caval extension. Curr Opin Urol 2011;21:104-9.
5. Rogers CG, Singh A, Blatt AM, Linehan WM, Pinto PA. Robotic partial

nephrectomy for complex renal tumors: Surgical technique. Eur Urol 2008;53:514-21.
6. Donohue JP. Retroperitoneal lymphadenectomy: The anterior approach including bilateral suprarenal-hilar dissection. Urol Clin North Am 1977;4:509-21.
7. Stepanian S, Patel M, Porter J. Robot-assisted laparoscopic retroperitoneal lymph node dissection for testicular cancer: Evolution of the technique. Eur Urol 2016;70:661-7.
8. Steyerberg EW, Keizer HJ, Fosså SD, Sleijfer DT, Toner GC, Schraffordt Koops H, *et al.* Prediction of residual retroperitoneal mass histology after chemotherapy for metastatic nonseminomatous germ cell tumor: Multivariate analysis of individual patient data from six study groups. J Clin Oncol 1995;13:1177-87.
9. Gerber GS, Bissada NK, Hulbert JC, Kavoussi LR, Moore RG, Kantoff PW, *et al.* Laparoscopic retroperitoneal lymphadenectomy: Multi-institutional analysis. J Urol 1994;152:1188-91.
10. Schwartz MJ, Kavoussi LR. Controversial technology: The Chunnel and the laparoscopic retroperitoneal lymph node dissection (RPLND). BJU Int 2010;106:950-9.
11. Rassweiler JJ, Scheitlin W, Heidenreich A, Laguna MP, Janetschek G. Laparoscopic retroperitoneal lymph node dissection: Does it still have a role in the management of clinical stage I nonseminomatous testis cancer? A European perspective. Eur Urol 2008;54:1004-15.
12. Davol P, Sumfest J, Rukstalis D. Robotic-assisted laparoscopic retroperitoneal lymph node dissection. Urology 2006;67:199.
13. Dogra PN, Singh P, Saini AK, Regmi KS, Singh BG, Nayak B. Robot assisted laparoscopic retroperitoneal lymph node dissection in testicular tumor. Urol Ann 2013;5:223-6.
14. Cost NG, DaJusta DG, Granberg CF, Cooksey RM, Laborde CE, Wickiser JE, *et al.* Robot-assisted laparoscopic retroperitoneal lymph node dissection in an adolescent population. J Endourol 2012;26:635-40.
15. Williams SB, Lau CS, Josephson DY. Initial series of robot-assisted laparoscopic retroperitoneal lymph node dissection for clinical stage I nonseminomatous germ cell testicular cancer. Eur Urol 2011;60:1299-302.
16. Dudderidge T, Pandian ND. Technique and outcomes for robotic assisted post-chemotherapy retroperitoneal lymph node dissection (RPLND) in stage 2 non-seminomatous germ cell tumour (NSGCT). BJU Int 2012;110:97.
17. Cheney SM, Andrews PE, Leibovich BC, Castle EP. Robot-assisted retroperitoneal lymph node dissection: Technique and initial case series of 18 patients. BJU Int 2015;115:114-20.
18. Kamel MH, Littlejohn N, Cox M, Eltahawy EA, Davis R. Post-chemotherapy robotic retroperitoneal lymph node dissection: Institutional experience. J Endourol 2016;30:510-9.
19. Ehrlich Y, Yossepowitch O, Kedar D, Baniel J. Distribution of nodal metastases after chemotherapy in nonseminomatous testis cancer: A possible indication for limited dissection. BJU Int 2006;97:1221-4.
20. Sheinfeld J, McKiernan J, Bosl GJ. Surgery of testicular tumors. In: Walsh PC, Retik AB, Vaughan ED Jr., Wein AJ, editors. Campell's Urology. 8th ed. Philadelphia, PA: Saunders; 2002. p. 2920-44.
21. Carver BS, Shayegan B, Eggener S, Stasi J, Motzer RJ, Bosl GJ, *et al.* Incidence of metastatic nonseminomatous germ cell tumor outside the boundaries of a modified postchemotherapy retroperitoneal lymph node dissection. J Clin Oncol 2007;25:4365-9.
22. Beck SD, Foster RS, Bihrle R, Donohue JP, Einhorn LH. Is full bilateral retroperitoneal lymph node dissection always necessary for postchemotherapy residual tumor? Cancer 2007;110:1235-40.
23. Heidenreich A, Pfister D, Witthuhn R, Thüer D, Albers P. Postchemotherapy retroperitoneal lymph node dissection in advanced testicular cancer: Radical or modified template resection. Eur Urol 2009;55:217-24.
24. Neyer M, Peschel R, Akkad T, Springer-Stöhr B, Berger A, Bartsch G, *et al.* Long-term results of laparoscopic retroperitoneal lymph-node dissection for clinical stage I nonseminomatous germ-cell testicular cancer. J Endourol 2007;21:180-3.
25. Evans JG, Spiess PE, Kamat AM, Wood CG, Hernandez M, Pettaway CA, *et al.* Chylous ascites after post-chemotherapy retroperitoneal lymph node dissection: Review of the M. D. Anderson experience. J Urol 2006;176 (4 Pt 1):1463-7.
26. Link RE, Amin N, Kavoussi LR. Chylous ascites following retroperitoneal lymphadenectomy for testes cancer. Nat Clin Pract Urol 2006;3:226-32.
27. Castillo OA, Litvak JP, Kerkebe M, Olivares R, Urena R. Case report: Laparoscopic management of massive chylous ascites after salvage laparoscopic retroperitoneal lymph-node dissection. J Endourol 2006;20:394-6.

How to cite this article: Singh A, Chatterjee S, Bansal P, Bansal A, Rawal S. Robot-assisted retroperitoneal lymph node dissection: Feasibility and outcome in postchemotherapy residual mass in testicular cancer. Indian J Urol 2017;33:304-9.